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A Prototype Health Financing Projection Tool Based on National Health Accounts: The *EgyptPro* Model

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Prepared by:

Alan Fairbank, Ph.D.
Abt Associates Inc.

Peter Berman, Ph.D.
Harvard School of Public Health

Afsar Akal
Health Insurance Commission

Roy Harvey
Health Insurance Commission

Katherine Burchfield
Health Insurance Commission

Partnerships
for Health
Reform
PHR

Abt Associates Inc. ■ 4800 Montgomery Lane, Suite 600
Bethesda, Maryland 20814 ■ Tel: 301/913-0500 ■ Fax: 301/652-3916

In collaboration with:
Development Associates, Inc. ■ Harvard School of Public Health ■
Howard University International Affairs Center ■ University Research Co., LLC

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Partnerships
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Mission

The Partnerships for Health Reform (PHR) Project seeks to improve people's health in low- and middle-income countries by supporting health sector reforms that ensure equitable access to efficient, sustainable, quality health care services. In partnership with local stakeholders, PHR promotes an integrated approach to health reform and builds capacity in the following key areas:

- *Better informed and more participatory policy processes in health sector reform;*
- *More equitable and sustainable health financing systems;*
- *Improved incentives within health systems to encourage agents to use and deliver efficient and quality health services; and*
- *Enhanced organization and management of health care systems and institutions to support specific health sector reforms.*

PHR advances knowledge and methodologies to develop, implement, and monitor health reforms and their impact, and promotes the exchange of information on critical health reform issues.

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Abstract

One of the objectives of the National Health Accounts (NHA) Special Initiative under the Partnerships for Health Reform (PHR) Project was to develop and test innovative approaches to using NHA-generated data for health system policy analysis. One major contribution to this objective was the development of a prototype NHA-based health system financing projection model based on available data from Egypt – the EgyptPro Model. This model was developed through linking previous work done by the Australian Health Insurance Commission on a Health Sector Finance Reform Model with PHR's development of NHA methods and data sources.

The breadth of the work described in this report is contained in three volumes:

Volume I provides the technical information needed by users to understand the construction of the EgyptPro Model and the use of the EgyptPro software.

Volume II presents the conceptual framework and key model relationships that were used as a basis for the EgypPro Model. The paper was written to provide interested readers with a technical exposition of how such a model could be developed.

Volume III describes the development and software of the Generic Health Financing Model.

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Acronyms

ANE	Asia and Near East Region
CCO	Curative Care Organization
DDM	Data for Decision Making Project
EHHUES	Egyptian Household Health Care Use and Expenditure Survey
ESA	East and Southern Africa Region
HIC	Health Insurance Commission
HIO	Health Insurance Organization
HSFRM	Health Sector Finance Reform Model
IHSG/HSPH	International Health Systems Group/Harvard School of Public Health
LE	Egyptian Pound
MOE	Ministry of Education
MOF	Ministry of Finance
MOH	Ministry of Health and Population
MOSA	Ministry of Social Affairs
NHA	National Health Accounts
OOP	Out of Pocket
PHR	Partnerships for Health Reform Project (USAID)
SHIP	School Health Insurance Program
SIO	Social Insurance Organization
THIO	Teaching Hospitals and Institutes Organization
USAID	United States Agency for International Development

Acknowledgments

This report was made possible through the work of many people who have participated in a collaboration of two teams of professionals from opposite sides of the planet—located in Canberra, Australia, on the one side, and Boston, Massachusetts, and Bethesda, Maryland, on the other. In addition, the study benefited from the work of the many people who were involved in producing the reports on National Health Accounts in Egypt in 1991 and in 1995, and who conducted the research which generated much of the data on the Egyptian health care system which were used to construct and test this prototype model, called *HealthPro–Egypt*. Communications between the teams, and the sharing of files and documents, was greatly facilitated by the Internet.

HealthPro–Egypt combines important elements of the national health accounts methods developed at the Harvard School of Public Health and the Health Sector Finance Reform Model developed by the Australian Health Insurance Commission.

The Partnerships for Health Reform team that worked on this activity included Alan Fairbank and A.K. Nandakumar of Abt Associates Inc., Peter Berman of the International Health Systems Group of the Harvard School of Public Health and Ibrahim Shehata of University Research Co., LLC. The team from the Australian Health Insurance Commission included Afsar Akal, Katherine Burchfield, Roy Harvey, and Karl Karol. Production and editing of the report was ably performed by Geraldine St. Louis and Nicola Cummings of the Harvard School of Public Health, and Kathy Mion and Linda Moll of the PHR Project in Bethesda.

HealthPro–Egypt was developed using data collected through the previous collaboration between the Ministry of Health and Population, Government of the Arab Republic of Egypt and the Data for Decision Making Project, Harvard School of Health. The data used are all available in public domain sources published by the Data for Decision Making Project on the International Health Systems Group website at www.hsph.harvard.edu/ihsg/ihsg.html. The sources include the Egypt National Health Accounts, household and provider survey reports, reports of the Budget Tracking System, a variety of facility costing studies, and analysis of Egypt's school children's health insurance scheme. We would like to acknowledge and thank our counterparts at the Ministry of Health and Population in Egypt for their important contributions to this effort.

The study began in July 1999, and the final results were presented at a seminar held at Abt Associates offices in Washington, DC, on April 28, 2000. We would like to acknowledge the helpful comments and suggestions of seminar participants at Harvard School of Public Health, Abt Associates, and USAID. Alexander Preker of the World Bank helped move this project from an idea to final product.

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Executive Summary

During the past several years, there have been two concurrent efforts to assist developing countries in improving their data and policy analysis capabilities within the health sector, that focus on assessment of the costs and financing of medical care. The Partnerships for Health Reform Project (PHR), a U.S. Agency for International Development (USAID) project, has developed an approach to organizing and presenting data on national health sector expenditures, known as National Health Accounts (NHA). The second effort, started by the Health Insurance Commission (HIC) and funded by the World Bank, has led to the development of an approach to modeling health sector and financing reform in both developed and developing countries. This model is known as the Health Sector Finance Reform Model (HSFRM).

Methods for modeling health financing as an element of health sector reform have evident overlap with methods for gathering and presenting national health expenditure data in NHA. As part of the PHR Project, the NHA Special Initiative decided to explore whether present NHA development efforts could benefit from being integrated with efforts at modeling the determinants of flows of health finance. This report documents the approach to, and results of, that integration.

In order to experiment with integration of the HSFRM and NHA, PHR collaborated with the HIC to perform the tasks involved. The scope of work for this activity is described in Section 2. The two teams from PHR and HIC jointly amended the conceptual framework developed by the HIC to incorporate NHA. This framework, outlined in Section 3, was used to develop the model, which is called *EgyptPro*.[1] The description of the model and its operation are detailed in Section 4.

The use of the model in making projections of future expenditures on health is tested by applying it to the case of Egypt, where there have already been two NHA estimation efforts—one in 1991 and one in 1995. To this end, the model was created to reflect the particular institutional and behavioral realities of the Egyptian health care system, and was loaded with data compiled from household and provider studies completed in Egypt in 1995. After the basic model was completed and calibrated to the values estimated for the 1995 NHA, various policy scenarios were developed and were estimated using the model. This process and its results are described in detail in Section 5. Findings and recommendations of the project team are included in the final Section 6.

The general finding of this effort to develop a prototype is that this integrated model is a sound idea, both in theory and in practice, and that, after some modifications, its development and implementation should be pursued in other countries. The results indicate that country-specific replication of the model could provide countries with a powerful tool to estimate—as an aid to sectoral decisionmaking—the potential impacts of changes in policy and programs. Moreover, the model offers benefits specific to the goals and interests of USAID. Its comprehensive framework enables programmers to consider impacts of reform policies on both public and private sectors, and its disaggregated data base provides a foundation for examining program and policy impacts by region, age, sex, income, and insurance status. It is of particular help in analyzing the requirements and impacts of policies aimed at improving the sustainability of preventive and public health programs.

[1] *EgyptPro* is the name given to the model for purposes of describing it in this report. The actual name of the software program is "HealthPro – Egypt."

1. Background

With funding from the U.S. Agency for International Development, the International Health Systems Group/Harvard School of Public Health (IHSG/HSPH) developed an approach to organizing and presenting data on national health sector expenditures, known as National Health Accounts (NHA). Through the PHR Project, NHA methods have been implemented in eight countries of the Latin America and Caribbean region. In addition, NHA is being developed and institutionalized in the East and Southern Africa (ESA) and Asia and Near East (ANE) regions.

With World Bank funding, the Health Insurance Commission (HIC) developed an approach to modeling health sector reform in both developed and developing countries, known as the Health Sector Finance Reform Model (HSFRM). This model has been specifically developed for, and applied in, Turkey, Bulgaria, and Romania [2], and has assisted the governments of these countries in assessing the potential impacts of alternative approaches to reforming the ways in which they deliver and finance health care to their populations.

Because methods for modeling health financing as an element of health sector reform overlap with methods for gathering and presenting national health expenditure data in NHA, the NHA Special Initiatives, a part of the PHR project, decided to explore the benefits of integrating NHA development efforts at modeling the determinants of flows of health finance. If successful, the results of integrating NHA with financial models in the health sector could provide countries with a powerful tool to simulate the potential impacts of changes in policy and programs as an aid to sectoral decision-making.

1.1 The Health Sector Finance Reform Model

The Health Sector Finance Reform Model is a generic framework that can be tailored to the institutional and financial arrangements of a country. The model's structure enables users to do the following:

- Make projections of use, cost, and distribution of health services;
- Analyze the potential impact of alternative health policies along a number of dimensions;
- Calculate which groups will gain, which groups will lose, and by how much, from alternative health policies; and

[2] Under the sponsorship of the World Bank, HIC developed a health financing model for Turkey during 1995 that was used to model the outcomes of alternative health financing options, particularly on cost and government obligations. On the basis of that work, HIC developed a case study modelling the health system and health sector reform options in the fictitious country of "Reformistan." HIC presented the case study at a World Bank workshop in June 1997. The presentation included documents that: 1) provided a conceptual framework showing how the model would facilitate economic analysis of health sector reform; 2) described the design of a "Generic Health Financing Model;" and 3) provided a user guide to the software. HIC has also developed models for Bulgaria and Romania.

> Identify the relative (potential) importance of alternative policy levers in achieving particular goals.

1.1.1 Structure of the HSFRM

The HSFRM is composed of two major components or modules: the "service use" module and the "finance" module.[3] The modules are connected through the use of matrices that are shared for particular calculations. Both modules use data from matrices quantifying "population," "service use," and "resource availability (use)" as basic building blocks. The matrices can be dimensioned according to data availability. For example, population and service use arrays can be dimensioned by age, sex, region, income, and insurance status if sufficient data are available. While the finance module is denominated in terms of revenue and expenditure, the service use module is quantified in terms of services and resources used.

Based on data input to the model, the service use module calculates the quantities of services "transacted" (produced and consumed) in the health sector. Its structure allows the user to model both consumer behavior, determinants of the demand for services, and producer behavior, determinants of supply for services. The explicit intent of this module is to recognize the need for a balance between the number of services (resources) actually needed and/or desired by consumers and the number of services (resources) made available by producers, and to quantify any imbalance. If an imbalance exists, typically because scarcity of resources constrains fulfillment of demand or limits full provision of an entitlement, the model results show this and allow the user to contemplate how such an imbalance can be corrected, and then entered into the model. If demand for medical services (discretionary consumption) is constrained by inadequate supply, adjustments to prices and quantities, subject to government regulations, would usually clear the market. If provision of services to which people are entitled is constrained by inadequate supply, then policymakers would need to choose how to ration available resources or how to expand resources to make the supply adequate. In summary, this module allows a user to weigh the physical resources on both demand and supply sides of transactions, to consider the question of balance, and to postulate alternatives for correcting any evident imbalances.

The finance module serves a similar function by determining the degree to which revenues—expended health budgets and all other spending on health—are sufficient to meet financial obligations incurred for services rendered. This module is especially useful for identifying gaps between future revenues (i.e., projected spending) and expenditures needed to meet expected obligations.

1.1.2 Data Needs of the Model

The structure of the model allows it to make use of a wide range of data, from simple aggregate population data to age, sex, income, insurance status and region data. If sufficiently detailed data are available, the model can assist with the analysis of issues, including distributional impact of various policy options across income groups and geographic regions.

Consideration of a wide range of issues, however, requires detailed data from various sources. These data, including data on health spending and utilization behavior by households and individuals,

[3] The HSFRM does not incorporate consideration of the "health outcomes" module or the "health sector-general economy" module, as included in the generic model. However, both of these modules could be incorporated if the relevant data were available.

and data on resource use and prices for health care providers, are not typically available except when generated by household or other population surveys, and health care provider studies. While this factor can make the model difficult to implement in some developing countries, it does offer some distinct advantages over other kinds of policy analyses that do not use such detailed data.

1.1.3 Operation of the Model

A "model" seeks to replicate in the abstract, or represent, the relationships among defined entities (variables), so that it can project in to the future how the characteristics (values) of those entities change when the characteristics of related entities change. Because it is computer-based, this model enables the user to enter data and make calculations efficiently, and can automate the generation of statistics and reports based on those calculations.

In this model future values are usually determined by relationships that are fixed or are influenced by fixed parameters or growth assumptions input into the model. Few of the dynamic variables have values endogenously determined by the model calculations. Instead, these variables require that the analyst enter their values as parameters. The components that are dynamic or can be be determined by formulae expressing specified relationships within the model are: population, service entitlement/demand, and resource and revenue optimization. These components account for known changes that are fairly predictable and are accommodated within the model in a straightforward and transparent manner.

Thus, the structure of this model is quite flexible. It requires that any other dynamic elements postulated in the modeling process be determined by the analyst exogenously—that is, they are calculated outside the model and entered into the model as parametric assumptions.[4] The variables typically have values for a year's time period,[5] and they are given projected (future) or historical (past) values when multiplied by a matrix of parameters which specify how the variables will grow or decay year by year. Specifications are based on assumptions or calculations made exogenously. Many of the parameters entered into this matrix are based on particular relationships among variables determined from their relative values in the base year. For example, productivity of physicians, as defined by number of visits per physician per year, is calculated by dividing the total number of visits by the total number of physicians in the base year, then multiplying by an assumed growth factor for other years.

[4] When constructing a country-specific model based on the HSFRM, the software programmer exercises considerable judgement about how many dynamic relationships are incorporated within the software of the model itself. An example would be to allow migration of doctors between urban and rural areas to be influenced by differences in relative incomes of physicians across geographic regions. In the case of Egypt, the model has relatively few such dynamic elements because of the institutional complexity of the Egyptian health care system, because of the limitations of the available data, and because of the desire to give maximum flexibility to the analyst using the model.

[5] This is due to data availability. After several NHA estimates have been completed, it would be possible to enter past (revised) estimates of NHA components, so that there would be more than one year of "actual" numbers which would generate a time series as the basis for future projections.

1.2 National Health Accounts

Analyses of policy issues related to resource scarcity in the health sector are critically dependent on the availability of reliable information concerning the flow of funds in the sector. In developing countries, the necessary data is not readily available and there has been little organized effort to collect, organize, tabulate, and present the necessary data in a standardized and policy-relevant manner.

Responding to this need, USAID and other bilateral and multilateral organizations have supported a concerted worldwide effort to assist governments in developing national health accounts. These efforts are grounded in the experience of the United States and OECD countries with the NHA methodology that show it can highlight policy problems, enhance cross-country comparability, and thus increase the likelihood that data collection efforts will be repeated regularly. Implementation of the NHA data framework and methodology in developing countries will provide those governments with similar benefits through the use of a standardized tool for organizing, tabulating, and presenting health sector expenditure information.

PHR has been at the forefront of this international effort to institutionalize NHA in developing countries. In collaboration with the Data for Decision Making (DDM) Project, PHR helped to disseminate the first software program for organizing and presenting NHA data in 1996. This program is now being revised and updated. Eight Latin American and Caribbean countries have implemented a first round of NHA studies and several are working on another estimation. In addition, 18 countries in East and Southern Africa, Asia and Near East regions are nearly finished their first NHA studies.

1.2.1 The Structure of NHA

The NHA framework provides an analytical structure consisting of three essential elements. First, it requires the calculation and presentation of national estimates through a "sources and uses" matrix. Second, it allows for extensive disaggregation of the categorical sources of spending beyond the general categories of "public" and "private." Third, it provides a systematic framework for defining uses according to several important, and mutually exclusive, classifications. This NHA structure facilitates the need to know, at a national level and in an integrated way, who pays, how much, and for what in the health sector. It does more than simply separate the *who* from the *what* by including an intermediate category—financing agents—that allows for the division between the financing and the provision of services.

This capability of linking sources and uses is an important aspect of the value of NHA for analyzing health care financing policies. Health financing is not solely concerned with raising funds for the health sector, but also plays an important role in determining the allocation of expenditures and the behavior of providers and consumers. Policies affecting the practices of the financiers of health care (the sources), need to be designed, monitored, and evaluated in terms of their influence on the uses of funds in the health sector both in terms of who receives them and what they produce as a result. The "sources and uses" method is a means to that end.

1.2.2 Data Needs of NHA

Since the components of NHA are aggregates of major financial flows among the sources of financing, the financing agents, and the providers, the need for data is largely dictated by matching the estimation method to the data that are available. For public sector entities, budgetary data is the primary source of data. For private sector entities, NHA requires innovative and ad hoc methods for estimating private sector quantities. The data available on health spending and health-seeking behavior in household surveys are extremely useful for estimating private sector spending on health. Estimates can be checked and sometimes improved. Efforts to "triangulate" the estimates by running consistency checks, for example, compare total spending with total receipts in each category.

The HSFRM is potentially useful as a foundation for a NHA estimation model because of the benefits associated with the use of surveys. It is anticipated that the disaggregated structure and data needs of HIC's HSFRM can be usefully integrated with the NHA structure to produce a versatile and beneficial model for both producing NHA estimates and facilitating its many policy analytic applications. This expected result is the primary motivation for this activity.

2. Objectives

The objective of PHR's NHA Special Initiative is to develop a tool that will lead to better informed policy processes. If a computerized model of a country's health financing could be integrated with the compilation of the country's national health accounts, there might be substantial benefits to a variety of policy analytical efforts in the health sector of that country. The following objectives were designed to determine if such a tool or model could be developed and shown to be workable:

- In collaboration with HIC, adjust the HSFRM so that it is integrated with the established framework of NHA used by PHR.
- Develop a conceptual framework for the model as the basis for software development.
- Develop software specifications and functionality of the model for general application.
- Based on data developed by the Data for Decision Making Project, adapt the general model to the specifics of the Egyptian health system and its production/consumption characteristics (population-based) for application in a specific policy scenario.
- Calibrate the Egypt application with respect to the NHA output function to reflect the 1995 NHA amounts reported in the 1997 Egypt NHA report.
- Develop and report on at least one policy scenario that demonstrates the utility and benefits of the model for policy analysis.

3. Model Conceptual Framework: Theory and Specification

The conceptual framework[6] for the model incorporates two modules: a service-use module describing the material/physical transactions, (e.g., outpatient visits, days in the hospital, etc.), and a finance module describing the financial transactions (e.g., revenues, budgets, amounts spent on inputs, etc.). Both modules are driven by the same data on population and service use, disaggregated according to five demographic dimensions (age, sex, region, insurance status, and income quintile).

The conceptual framework states that there are two parts to each module. In the services module, the supply of resources (staff, drugs, supplies, etc.) is modeled independently of the demand for services (visits, admissions, etc.). Theoretically, the task of the modeler is to make the two sides equal by manipulating parameters and variables and closing the divergence between demand and supply. The modeler changes those public policy levers that can be changed to suggest what policies would achieve balance.

A similar process occurs on the financing side. Revenues are modeled independently of expenditures. The modeler must close any divergence between them in the model projections by changing some parameters or variables until they are equivalent. Once again, the public policy levers that can be changed, namely budgets and taxes, are the ones most easily tested in the model. These are less easily implemented in practice, however.

To explore the intricacies of a disaggregated model in the pluralistic Egyptian system, the structure adopts some simplifying conditions to reflect the country-specific attributes of the health system and to accommodate data limitations.

First, the model is calibrated to an actual 1995 NHA (Rannan-Eliya, et al., 1997). Based on this calibration, the demand for services equals the supply of services at a known cost or price, for each unit of service consumed. Projecting future expenditures using these costs, or supply relationships, introduces a strong short-run bias to the model. This limits the scope of adjustments that can be made to rates of use of services or to efficiency parameters that affect costs. This short-run bias could not be corrected due largely to a lack of time series data.

Second, on the financing side, any assumptions about the linkages between service demand and supply—and the impact of financing arrangements on both—are determined by the analyst outside the model.[7] Budgeted systems, like services provided by the Ministry of Health and Population (MOH), show increased expenditure for increased volume in the base scenario. The analyst can change this relationship by changing assumptions. Other systems, like Health Insurance

[6] This section summarizes the detailed exposition of the conceptual framework developed as part of this project and reported in the HIC report, "Economic Analysis of Health Sector Reforms: A Conceptual Framework," 1999.

[7] The principal reason that these relationships have not been hardcoded in the model is to allow the analyst flexibility in a situation where the real relationships are not known. If required, relationships such as the linkages between service demand and supply, and how financing arrangements might affect them can be programmed into the model, removing the burden from the analyst. Because this project was not undertaken in Egypt and there was no opportunity to discuss these relationships, the judgment was made to retain that maximum flexibility in this instance.

Organizations (HIO) and the private sector, can show deficits or surpluses because, in contrast to systems financed by budget transfers, revenues as well as costs are independently modeled.

Overall, the model depends on off-model calculations by the analyst to arrive at appropriate and relevant values for many of the parameters. It is a calculation tool, not a true simulation model seeking an equilibrium solution. This is a positive attribute because as a calculation tool, the model gives the analyst great flexibility by granting full control over the assumptions used. Moreover, simulation models demand a level of data and skills that may not be available to the extent needed in many developing countries. There are, however, several drawbacks:

1. In making the key assumptions as noted, the burden is placed on the analyst to ensure consistency and plausibility in the explicit and implicit relationships among the numerous parameters to be entered into the model. In this process, the impact of policy variables being modeled is necessarily implicit in the assumptions rather than explicit in the modeling.

2. Many of the parameters describing the interrelationships of key variables in the model are based on calculations of such relationships in the base year (1995). Though the model allows the analyst to vary the growth of these parameters, and even to change their absolute values, one can only reasonably do so on the basis of off-model modeling. Entry of the required data is very time-consuming, and tracking and documenting the changes is a demanding task. In particular, assumptions implicit in the model's structure require the analyst to make off-model estimates of adjustments to key parameters in the model. These are: (1) that changes in projected total cost are the product of changes in volume and changes in average cost, instead of marginal cost; and (2) that changes in relative costs of inputs do not result in input substitution.[8]

3. The distribution of services among providers is not linked to the data cells on population enrollment within the model. Such linkages must be established off model, and need to be changed whenever service distribution or enrollment distribution are changed independently. For each scenario modeled, any changes in the base-year distribution of services shares must be entered after normalizing the changed shares to equal one.

Despite these difficulties, the integrated model offers many features, promising significant benefits to program managers, policy analysts, and decision-makers:

1. The simplified architecture of the computer model provides great flexibility in its use. The analyst retains control over all equations that are subjective—such as elasticity of demand—and is forced consider all the implications of assumptions that are made. This flexibility allows for use of a broad range of analytical functions, ranging from cross-tabulations of data of policy interest, to comprehensive analyses of sector financing.

2. While the model is currently based on 1995 data, its design and operation is versatile enough to be adapted to new data or new health system realities with relative ease.

3. If a country undertakes to develop and use such a model, country-specific dynamic elements can be built into the model over time, as policy analysts and stakeholders develop an understanding of these relationships.

[8] Input/output ratios in government services do not respond quickly, if at all, to changes in relative costs. However, thare are political and administrative factors that would change input/output ratios over time.

4. By integrating a model of financial and resource use with one estimating national health accounts, each task accounts for the parameters and requirements of the other. In the future, the application of this model to develop NHA estimates will make it more useful in the policy process as a generator of widely accessible and internally consistent data about the entire health sector.

4. Development and Calibration of the Model

This section provides an explanation of how the computer model is designed to fit within the overall conceptual framework for integrating extended NHA with the health care financing reform model. It describes the sources and definitions of data providing the foundation for the model's calculations. In addition to a description of the *EgyptPro* software, its installation, operations, and documentation, this section presents the calibration of the model to Egypt's 1995 NHA estimates.

4.1 Model Design

4.1.1 *EgyptPro* within the Broader Conceptual Framework

The computer model, *EgyptPro*, is the automated component of a general model for extended national health accounts. There were essentially three steps in developing this model. First, as described in Section 3, a conceptual framework was developed, that explicitly incorporated extended national health accounts into the HIC's previously developed health care financing reform model.

Second, a computer model was developed adapting and simplifying the broader conceptual framework so that it could reasonably represent the specific structure and data availability of the Egyptian health care system. The computer model is the central part of the broader analytical effort required to implement the conceptual framework.

Third, Egyptian data were compiled, entered into the computer model, and calibrated to previously determined values of Egypt's 1995 NHA. After working with the initial model (*EgyptPro 1.0*), it was revised (*EgyptPro 1.1*) and used to generate the scenario results reported in Section 5.

It is important to recognize that the computer model, *EgyptPro,* is not a general equilibrium model of the health sector. None of the major dependent variables in the model are designed to be interdependent with any other dependent variable; that is, nothing is endogenously determined. Virtually all of the interactions of the major behavioral and market-determined inputs and outputs of the health sector—the prices, utilization, and costs of medical and health services—must be determined by the analyst and then put into the model as parametric assumptions. *EgyptPro,* then, performs calculations on the data input so that aggregations of the various financial flows can be presented in ways that are both policy-relevant and internally consistent across all the major actors of the sector.

4.1.2 Modeling the Egyptian Health System: Adapting the Conceptual Framework

The computer-based portion of the Egypt Health Sector Reform Model (*EgyptPro*) consists of two modules: service use and finance. The service use module focuses on the capacity of the health sector to support demand for health services in future years by supplying sufficient health services to meet that demand. By contrast, the finance module is concerned with the flow of funds from sources to uses and whether or not there are enough funds available from these sources to finance the uses. The validity of the results from using *EgyptPro* rests on two major assumptions: (1) services actually used represent a balance between service demand and service supply; and, (2) expenditures actually made by major actors in the health sector represent a balance between need for, and availability of, financing for those services. It is the responsibility of the analyst to ensure that off-model manipulation and compilation of parametric data and of growth rates applied to them are plausible, reflective of recent trends, and consistent with theoretical assumptions.

For most purposes, it is assumed that the cost of production[9] equals the cost of consumption, so that estimating one is the method for predicting the other (e.g., for provider groups relying upon budgetary transfers for financing). For those cases where these costs can diverge, where delivery systems and financing systems are separate and perhaps independent (e.g., the private sector), it is necessary to calculate each independently.

For calculating consumption costs, the common denominator of both components of the model is population. On the service side, population underlies calculations of total services used (a multiple of average use). On the finance side, it underlies calculations of total payments for premiums, out-of-pocket expenses for fees, and relevant taxes and contributions (a multiple of average payment). For calculating production costs, the units of service generated on the service side are used as the denominator to calculate total costs on the finance side (a multiple of average costs of various inputs per unit of service).

In brief, the purpose of adapting the conceptual framework is to reduce the indicated computerized calculations to the following formulae: (Note that *parameters* or *array-type data* and **modeled elements** are highlighted as such.[10])

Number of services used = *rate of use per person* times *population*
Revenues gained = *rate of assessment per person* times *number of persons assessed*
Labor costs = *labor input/output ratio* times *efficiency* times *cost per labor unit* times **number of services used**
Non-labor costs = *non-labor cost per unit of service* times **number of services used**
Expenditures = **labor costs** plus **non-labor costs**

Service use rates, input/output ratios, and average costs are determined for the base year of the model, which has the most reliable data available. The specific structure and dimensions of the model are dictated by the availability of data and by the specifics of the Egyptian health care system. In addition, the model is shaped by the need for aggregated values of each of the cells of the extended NHA matrices, and by the specific disaggregated data elements, which are available from the survey.

[9] Including any profits and surpluses/deficits.

[10] Parameters are constants and are basic data inputs. Modeled elements are variables determined by manipulating basic data by formulae. Further explanation follows in the text.

The model is built to generate a variety of reports for any year within the thirty-year range from 1991 to 2020. Extended national health account matrices are one set of such reports. Given that the data input into the model is for the 1995 base year, a projection to any year between 1991 and 1994 would be a "backcast" and a projection to any year between 1996 and 2020 would be a "forecast."[11]

4.2 Model Data: Sources and Definitions

As mentioned earlier in this document, the nature of any health financing model must be based largely on the availability of data and the dimensions of that data. Data affect the structure of the model, the types of reports the model can produce, and, therefore, the functionality of the model. The minimum data set required to develop a functional health sector reform model that can answer the majority of policy questions was identified in the conceptual framework document.

Almost all the data used in the model are available in public domain sources as listed below. In some cases, the available data was analyzed further to obtain needed values. The main data source for the Egypt Health Sector Reform Model was the *1994-95 Egyptian Household Health Care Use and Expenditure Survey (EHHUES)*.[12] EHHUES was used to obtain data on population, service utilization for hospital and medical services, and out-of-pocket spending by households. The DDM project and the Egyptian Ministry of Health and Population carried out the USAID-funded survey. The tabulated results are published in *DDM's Report on the National Health Care Expenditure and Utilization Survey*. Results from the survey sample were compiled into appropriately aggregated values, defined by demographic variables, and were then extended to apply to the Egyptian population. Other data sources used for populating the model with data were:

- National Health Accounts of Egypt 1997
- A Reform Strategy for the Health Insurance Organization 1993 (Draft)
- Egypt Health Sector Reform Program
- Cost Analysis and Efficiency Indicators for Health Care: Report Number 1 – Summary Output for Bani Suef General Hospital, 1993-1994
- Cost Analysis and Efficiency Indicators for Health Care: Report Number 2 – Summary Output for Suez General Hospital, 1993-1994
- Cost Analysis and Efficiency Indicators for Health Care: Report Number 3 – Summary Output for El Gamhuria General Hospital, 1993-1994
- Cost Analysis and Efficiency Indicators for Health Care: Report Number 4 – Summary Output for 19 Health Care Facilities in Alexandria, Bani Suef and Suez, 1993-1994

The remainder of this section addresses data assumptions and compilation issues associated with the model development.

[11] Since forecasts are only as reliable as the assumptions made by the analyst, it would be misleading to think of them as predictions. Projections made by the model are reasonable expectations of future values based on the analyst's best estimates of future values of important assumptions as indicated by trends of the recent past.
[12] The availability of these data is the reason for basing all other data to the 1995 year.

4.2.1 Population

Demographic data and much of the data on health-seeking behavior and health spending was drawn from the EHHUES (1994-95). The sample size for the survey was 50,661. The proportion of individuals who fell into each of the population groups (sorted by age, sex, region, income, and insurance status) was used in conjunction with the sample size to determine the population distribution weights for each group. These weights were then applied to an estimate of the Egyptian population in 1995[13] to distribute the entire population into these groups according to the weights assigned in the survey.

Having estimated the population in each group in 1995, the population was projected to 2020, and backcast to 1991 assuming a growth rate for 1991-1995 of 2 percent yearly. World Bank projection figures were obtained for the years 2005, 2010, and 2020 and then used as a basis for assigning linear growth between these years.[14]

Factors such as mortality, fertility, and morbidity were not explicitly included in the model. Presumably these have been factored into the World Bank population projections that were used as a basis for the model projections. The major drawback of population as it has been modeled is that its static nature does not explicitly reflect the effects of demographic factors such as aging over time.

As the primary driver of the model, population is an appropriate starting point for model development. It was determined that age, sex, region, income, and insurance status were the population dimensions that would allow for consideration of a range of policy options for the Egyptian health sector. As detailed population data were required, the EHHUES sample population was used to calculate the population in each group. Based on this data, the viable dimensions of each group were:

- **Age**: Population was divided into four age groups: 0-5, 6-18, 19-49, and 50+. This was done for two reasons: (1) it was the maximum detail (i.e., minimum cell frequencies) the data would support and (2) there was particular interest in the recently commissioned School Health Insurance Program (SHIP), predicted to affect children in the age range 6-18.

- **Sex**: male, female

- **Income**: Income was divided into five quintiles. The sample population was ranked according to the per capita household income of every respondent. The average of each 20 percent segment of that ranking was then applied to everyone linked to that group in the general population.

- **Region**: Although it would have been preferable to obtain details of the population living in more specific regions, this was not supported by the survey data. The population was modeled from three regional divisions: (1) Governorates (metropolitan Egypt), (2) Urban (upper Egypt), and (3) Rural (lower Egypt).

- **Insurance Status**: It was originally intended to divide the population of each age, sex, region, and income into the insurance programs in which they participated. However, the

[13] The 1995 population estimate was obtained from the *Egypt Health Sector Reform Program, Ministry of Health and Population, 1997,* Table 1.2.1.2.A.

[14] For the period 1995-2000, the average annual population growth was assumed to be 1.9 percent.

available data allowed consideration of only the following two groups:[15] (1) the insured (yes) and (2) the uninsured (no).

In summary, the population entity of the Egypt Health Sector Reform Model was created through two simple calculations:

1. Population Sample / Population Sample Size = Sample Population Distribution

2. Population Sample Distribution x Population Point Estimate = Population (by age, sex, income, region and insurance status)

4.2.2 Service Use

For the purposes of modeling service demand/service use, hospital and medical (clinical) service use are considered separately for each identified health care provider. The list of providers included in the model was determined by the household survey. The categorization of the providers in the survey does not translate exactly to the providers available in the administrative sources, which is not consistent across hospital (inpatient) and medical (outpatient) services. The following organizations have been classified as hospital and medical health care providers in Egypt for the purposes of the model.

Hospital (inpatient):

> MOH: Ministry of Health and Population

> HIO: Health Insurance Organization

> CCO: Curative Care Organization

> Private hospitals

> Other government (including teaching and university hospitals)

Medical (outpatient):

> MOH hospital-based outpatient clinics

> MOH health units

> HIO clinics

> Other government (including clinical care organizations, which are strongly represented in the administrative sources)

> Private clinics

[15] While insurance program participation was excluded when modeling the elements in the service use module, the data on "Number of HIO beneficiaries by Law" (obtained from Table 1 of *A Reform Strategy for Health Insurance Program)* were used to model premium revenues of the HIO. Parametric assumptions were introduced in *EgyptPro* to ensure that the variance between the reported number of beneficiaries in the EHHUES and the administrative data were correctly balanced.

- Teaching hospital clinics
- Mosques
- Pharmacies
- Other

The EHHUES survey provided data on hospital admissions and medical contacts for the above providers. These data were used as a measure of service utilization, but did not refer directly to service types (functions). As a result, services were assigned to functions based on certain assumptions or judgments regarding providers.

The survey data on hospital admissions, length of hospital stays, and number of outpatient contacts were converted into population rates, by provider, for inpatient admissions, occupied bed-days, and outpatient visits. The end result of the service use data compilation process is estimates, for 1995, of hospital and medical service use for the entire population by age, sex, region, income, and insurance status. This could be as many as 240 different values for the same service use rate variable.

4.2.3 Resource Use

In order to maximize the varieties of health policy and program priorities the model can address and the questions it can assist in answering, health resources actually used in service production need to be specified in detail. To this end, resources are divided into two parts: labor-related and non labor-related health resources. As with service use, they are divided into hospital and non-hospital (medical) resources and region. Modeling of the labor force requires the development and use of the following data points:

- Average cost of factor inputs per unit of output
- Input/output ratios for labor inputs
- Efficiency factors for labor inputs

These data points—one for each labor category, each provider type, and each region—were calculated using data from administrative sources and from the four cost studies of MOH hospitals and clinics conducted by the DDM Project.

The locations of the health care facilities that were part of these studies, were used as proxies for resource use by region. In other words, the health care facilities were allocated to urban (Suez general hospital and urban health centers), rural (Bani Suef general hospital and rural health centers) or governorate (El Gamhuria hospital in Alexandria and Mother and Child Health Clinics located in metropolitan areas). Then the input/output and unit cost figures for each category were considered representative of that entire region. Input/output ratios were expressed as the number of doctors, nurses and other staff per medical contact and per hospital bed-day.

As all three hospitals and the urban and rural health centers in the cost surveys are run by the Ministry of Health, the relativities between the regional input/output ratios for these MOH hospitals were used as proxies for the other four inpatient care providers (HIO, CCOs, private, and other) in the case of the hospitals and the other medical providers in the case of the health units. For CCOs, only

the input/output and unit cost data for governorates were used, since these organizations are only located in metropolitan areas. The expected number of staff were then compared to published employment figures for each of these providers to verify the figures. For providers where no data on employment were available, the total labor force figures for Egypt were used to adjust expected resource use upward or downward using the relativities outlined in the Ministry of Health cost studies.

After compiling, categorizing, and manipulating all staff and cost data, average costs of producing services in each of these regions were developed for three labor categories and three non-labor categories of costs. Four non-labor categories were developed for inpatient, since food is specific to that setting. For all providers, labor was categorized into three groups: physicians, nurses, and other staff. Non-labor costs were divided into the following categories:

- Drugs
- Medical supplies
- Food (inpatient only)
- Other costs

Staff were categorized as doctors, nurses, and other technical staff. Using the cost studies, the staff and expenditures for the inpatient and outpatient departments were separated. Staff and expenditures of patient support areas, such as diagnostic services (pathology, radiology, etc.) and hotel services (catering, cleaning, etc.) were allocated to the inpatient and outpatient categories on a pro-rata-FTE-employed-staff basis, to determine final functional area staff numbers and expenditure figures. Staff numbers were then divided by the total number of bed days and outpatient medical contacts for derivation of input/output figures.

Total services produced by type (five inpatient, six outpatient[16]) within each of the three regions were divided into numbers of staff providing those services in order to generate an input/output ratio for each staff type, for each service type, for each region. This resulted in 33 data arrays of three values (one for each region). The model also included an efficiency factor—initially set equal to one—for each staff/provider type to allow other efficiency factors to be entered independently of labor productivity. In fact, the efficiency factor must be used to adjust for expected differences between average costs and marginal costs,[17] as well as for actual changes in efficiency.

[16] Input/output ratios for staff were not used for calculating labor costs for mosque, pharmacies, and other outpatient providers, due to lack of data.

[17] When the volume of services produced or consumed per time period changes, the change in total costs equals the change in units of services times marginal cost, not average cost. Since data are rarely available for marginal costs, average costs (times some fractional factor) are used to approximate marginal costs, as is done here.

Efficiency parameters may be changed through the computer model's scenario management tool, if the user expects that the efficiency of one group (i.e. doctors) will increase in the future, or if the analyst wishes to consider the implications of changing the number of employed staff in the health sector, which may result from a policy change.

The labor forces for three medical providers (mosques, pharmacies and other clinics) were not modeled, since the data on the health labor force by provider, as reported in the *Egypt Health Sector Reform Program* report did not include these provider categories. It was assumed that staff employed in these health service delivery areas were compensated by direct user payments. Once the expenditure flows from households to providers were calibrated, an accurate estimate for total health expenditure was obtained, on the grounds that most medical personnel have dual (or more) employment contracts, in order to compensate for lower income structure in Egypt. Therefore, while the model cannot accurately estimate the actual earnings of all medical personnel in Egypt due to lack of data, it does account for total financial flows in the system.

To determine the size of the labor force for each labor category, the input/output ratios for each region were multiplied by an efficiency factor, which was set equal to one for all years for the purposes of the initial modeling exercise, projecting input/output into the future. Projected input/output is then multiplied by projected service use (medical contacts and occupied bed-days) for each region to calculate resource use – that is, the labor force required to meet service use in each region and for each health function. Based on the modeling of resource use, the health sector labor force would be expected to grow with the population requirements, reflected through a growth in service due to demographic and other factors. Under a status quo scenario, for example, it would be assumed that the observed known inefficiencies in the system would be likely to remain constant.

4.2.4 Revenue

Three health sector revenue flows were identified in the Egyptian health system and modeled individually. The flows were:

1. Health insurance contributions;

2. Co-payments at point-of-service from household out-of-pocket expenses on health; and

3. Donor funding, fees from services provided to other providers/agents, and other operating revenues.

General government revenue appropriated for the purpose of providing health and medical services through the several ministries with such responsibilities were not modeled independently of provider expenditures of those budgeted funds. The model does not contain any behavioral assumptions about government budget financing, since there was no basis for making these. Analysts can assume government will finance all public service volume at some cost or introduce changes in government funding through parametric assumptions. Methods for modeling provider expenditures are explained in the next section.

4.2.4.1 Health Insurance Contributions

In Egypt, health insurance contributions are collected for enrollment in the Health Insurance Organization (HIO) from households, firms (employers), and the government, as required by the following Egyptian laws:

- Law 32: government employees
- Law 79: public and private sector employees
- Student Health Insurance Program (SHIP)
- Pensioners and widows
- Labor accident cases
- Revenues from companies with waivers (firms which elected to opt-out from covering their employees and paying premiums as per Law 79, amended in 1984)
- Law defining the additional revenues for HIO/SHIP from taxes on the purchase of tobacco-based products

To reflect the operation of these laws in the model, HIO premium and contribution revenues were then defined as a function of the following variables:

- Number of employed people in Egypt;
- Number or contributors (of all employed persons) who are required to pay contributions according to Law 32 or Law 79
- Number of students enrolled under SHIP/HIO
- Number of pensioners and widows enrolled in HIO
- Non-contributing persons working for institutions which have opted-out from paying employee premiums to HIO
- Disposable income per capita (as a proxy for leviable income)
- HIO contribution rates as determined by above laws.
- Compliance rates
- Estimated average tobacco (cigarette) consumption per annum per adult person

The number of employed persons in Egypt was obtained from EHHUES data. This survey grouped respondents' employment status as either self-employed, working for someone else (employee), or working in a family business. The distribution of the sample population according to these three groups was applied to the projected insured population of Egypt.

A prorated estimate of coverage by Law 32 and Law 79 among the projected employed population was made by specifying a ratio as the independent value to calibrate against total number of beneficiaries under these laws, as reported in the Annual Report of Health Insurance Organization

in 1995. Based on this exercise, it was estimated that Law 32 covered 25 percent of employees in 1995 and Law 79 covered 21 percent.[18]

Student enrollment in SHIP was set at the level given in the 1995 HIO Annual Report, which was slightly lower than that reported in the EHHUES. This required an adjustment of the population distribution derived for the model from the survey. To compensate for this discrepancy, two adjustment parameters were introduced in the model. The first one is used as a scale-up factor for insured persons and the other as a scale-down factor for uninsured persons (for 6-18 year olds only). The distribution, thus modified, ensures that the total population of Egypt in 1995 according to model outputs matched with CAPMAS (Central Authority for Public Mobilization and Statistics)/World Bank estimates, as well as with the number of insured 6-18 year olds reported by HIO as insured under SHIP in 1995. Revenues are not dependent on the beneficiaries' or their parent/custodians' income. Annual contributions are set at a flat LE 4 per student paid by parents and a flat LE 12 per student paid by the government as a direct subsidy.

The widow and pensioner population enrolled in HIO was calculated by prorating from the survey data on all persons who were insured and in the 50+ age group.[19] The widow/pensioner ratio, defined as a parametric assumption, was set as an independent variable and multiplied by the 50+ population, the total of which was balanced to published widow/pensioner numbers obtained from the HIO Annual Report. Total income from widow/pensioner contributions was calculated by multiplying the estimated population with average disposable income per capita. The health insurance contribution for this population group of 1 percent was then applied to total widow/pension income to determine revenue from this group.

No administrative data were available from HIO published sources on the number of employees working for companies with waivers. Therefore, the assumption was made that incomes of all employees who were not covered by Law 32 and Law 79 could be classified as a potential pool from which the employer levy of 1 percent (due from "companies with waivers") would be collected.

Disposable income per capita as reported in the survey is based on both cash and in-kind income, and payroll systems vary in complexity with regard to an individual's leviable base income and total salary earnings. Despite these irregularities, the survey averages were taken as proxies.

The population estimated to be covered by Law 32 and Law 79 was then multiplied by disposable income per capita figures. Calculation of total income for each population group was based on the group's population characteristics. Earning differentials between young and aged persons versus medium-aged workers, female versus male employees, insured versus uninsured persons, were all taken into consideration. Total income for each enrolled group was then multiplied by the relevant health insurance contribution rates, which were set as parametric assumptions. Similar data reported in the 1995 HIO Annual Report were then used as points of comparison for data on HIO revenues. Initially, the model overestimated the revenues of the HIO, as expected.[20] Compliance rates were then introduced into the model as independent variables. With premium revenue dependent on compliance rates, it was possible to backsolve for the appropriate compliance values. Compliance

[18] Based on calibration results of the Egypt Health Sector Reform Model in 1995.
[19] Although it is quite common for some widows to be less than 50 years of age, most will be clustered above this mark. As the bottomline premium revenue will not change, no effort is made to distribute it among age and sex groups.
[20] Due to disposable income proxying where in-kind incomes and base plus bonuses distort the correct leviable portion of person's compensation.

rates thus become a form of calibration tool for modeling premium revenue,[21] and were used as calculated for each category of enrollee contribution.

The same method was applied to calculation of labor accident premiums. A contribution rate of half of one percent of leviable income was applied to total incomes of covered persons under both Law 32 and Law 79, and a compliance rate parameter was included for balancing purposes.

Another component of SHIP revenue is generated by the cigarette/tobacco consumption taxes. To model this revenue flow, it was necessary to estimate the average amount spent by the adult population (19+) in Egypt on cigarettes per annum.[22] Instead of using a compliance rate to calibrate the revenue numbers, average cigarette consumption per person in pounds was set as the independent cell and SHIP revenues from cigarette taxation was set as the dependent value. Based on a LE 0.1 per pack levy, it was estimated that the adult population spent on average LE 76 on cigarettes per person per annum.

Total premium revenue of the HIO was therefore the sum of: (1) premiums from employees and employers according to provisions of Law 32, Law 79 and Labor Accident provisions; (2) revenues from companies with waivers; (3) contributions from pensioners and widows; (4) premiums from parents of SHIP enrollees and from government; and (5) the levies collected from cigarette consumption.

4.2.5 Provider Expenditures

Calculation of provider expenditures (i.e., production costs) in the health sector was based on the number of resources (labor and non-labor related resource use) that were calculated as part of the service use module. Resources were divided into medical and hospital, and labor-related and non-labor-related expenditures, and were calculated by provider type and region. Non-labor expenditures were comprised of spending on drugs, medical supplies, food (for hospitals only), and other costs.

Labor-related expenditures were the product of the average salary and the number of each staff (a product of the relevant input/output ratio, the efficiency factor, and the total services produced). Non-labor expenditures were the product of the average cost per medical contact and the total number of contacts (services produced).

Estimated total labor-related and non-labor-related outlays from the initial modeling exercise were compared to the published data in the 1995 NHA reports and, where necessary, adjustments upward or downward were made using the calibration tools of the *EgyptPro* model. Chapter 1 expenditures of the MOH and published labor-related outlays of the HIO were used as the targets for expenditure figures, and the unit cost relativities between staff type and region of Egypt were kept constant. Differences between total outlays and labor-related outlays were set as the non-labor related

[21] The values for compliance specified in the model need to be analysed in conjunction with the method for estimating disposable income. For example, it would be preferable to set up the compliance rate as the dependent variable and adjust disposable income to calibrate as against the expected leviable income, if estimates of compliance were available from the HIO. Obviously, the model would generate estimates of greater accuracy if it were possible to obtain a better estimate of disposable income.

[22] Although some youngsters are also consumers of cigarette products, the cluster is mainly among mature and elderly persons. Even such low aged consumers exist, their incomes being lower than adults would suggest that actual payers of this premium is also clustered among the aged. No weights are set between consumption patterns of 19-49 year olds and 50+s due to absence of data.

calibration targets. In cases where data were available, drug expenditures were cross-checked with published figures.

Total expenditures on inputs needed to provide services are calculated the same way for both public and private sectors. For the purposes of this activity, which is to recreate the detailed disaggregated data foundation of the previously estimated 1995 NHA for Egypt, unit costs were adjusted to those levels required to make their product with reported service use equal to the estimated expenditures totals reported in the 1997 report of the 1995 Egyptian NHA.

However, sources of funding differ among providers. The private sector providers, as well as HIO, could show a surplus or a deficit if their revenues from all sources did not equate to their expenditures for factor inputs. For public sector providers besides HIO, it was assumed that the Ministry of Finance would provide whatever funding was needed to close any gap between revenues from all sources and the expenditures by the public entities on factor inputs. This assumption could be relaxed if the analyst's purpose was to calculate the amount of additional funding actually required by various hypothetical levels of expenditures on factor inputs, as may be required by corresponding levels of service use.

4.2.6 Out-of-Pocket Spending by Households

Out of pocket (OOP) expenditure was calculated for each classified medical health care provider on two counts—total OOP expenditure and OOP expenditure on drugs. The difference between the two counts was assumed to be OOP payments of user charges (fees for consultation) collected by the provider institutions. OOP expenditure on drugs is obviously a component of total OOP expenditure, but drugs are considered to be a large proportion of private expenditure on health. Total OOP expenditure helps to explain private expenditure from households to households (in the sources-to-uses NHA matrix), while OOP expenditure on drugs helps in calibrating the flow of funds from households to pharmacies.

Data for OOP expenditures were compiled from results of the EHHUES, in the form of unit cost (to the patient) per medical contact. In some instances, published data were used to verify the figures, which were output from the model for OOP expenditure. Dimensions of OOP expenditure varied across providers. Recall that the dimensions incorporated into the model were based on the dimensions of population – being age, sex, region, income and insurance status. For example, teaching hospital data was available split by income quintile only. Due to a small number of response hits in the survey for this provider, average income was used. "Other Government" health care and mosque provider data were split by region and income to account for no-response categories from the survey.

For both inpatient and outpatient care services, summary data were chosen on grounds of the number of response hits in the survey, as the data source for all OOP expenditure was the EHHUES. As the major provider of health services, the MOH attracted the highest number of response hits from the survey, so calculation of out-of-pocket expenditures per bed-day by age, sex, region and income was not a difficult task. For the four remaining hospital providers, an iterative process of running cross-tabulations of the data was undertaken. This assisted in the choice of best combination of explanatory variables in estimating OOP expenses. In cases where the number of hit responses was few, the summary was based on a single population characteristic, such as age or income.

4.3 Model Software: Description, Installation, Operation, and Documentation

4.3.1 General Description of *EgyptPro*

EgyptPro is a computer-based policy modeling tool designed to facilitate the automated storage and processing of data for the development of the Egypt Health Sector Reform Model. Despite the widely acknowledged limitations of currently available modeling tools, certain features of this particular software package are particularly useful.

EgyptPro is Windows-based software application tailored specifically for modeling the financial and policy dimensions of the Egyptian health system. Microsoft Office 97 Suite and the 1997 version of Microsoft Excel with ODBC (open database connectivity) devices are required to run the program. The program has been tested and run on Windows 95/NT. Windows 98 compatibility has not been tested, but no errors should be expected.

The software does not require knowledge of modeling techniques, Further, a modeling expert with limited knowledge in spreadsheet and relational database techniques has the capability to build and populate a health sector model. However, knowledge of modeling techniques will assist in reducing model production time by significant amounts and enhance the reporting facilities of a standard Excel spreadsheet or relational model.

4.3.1.1 Model Structure

The model is composed of twelve linked Excel files designed and constructed to make the most efficient use of computer memory and computational speed and capacity. These files are comprised of the following components:

The file **xnha.xls** includes the main control program, which performs calculating tasks using the other files. Opening this file starts the model, and all modeling tasks are basically directed from this file. This file also stores two databases—the 213 parameters and 121 arrays of data used by the model.

The file **xnhadbn.xls** contains the 42 raw data variables (each having potentially 240 different values generated by the five population group data fields for that number of population groups) used by the model.

The file **nhadbase.xls** contains pre-calculated and saved values of the six NHA matrices based on a particular scenario and projection year.

The file **repdbase.xls** contains the output required for generation of all reports except the NHA reports (the population-based, general purpose, and comparative and time-series reports).

The file **scen.xls** provides storage space for all scenarios developed by the model for possible projections of future values of modeled elements.

The file **modlog.xls** provides a listing of the mathematical formulae, which form the basis of the calculations inherent in the model's projections of scenarios.

Calculations of modeled elements and storage of relevant parametric values are stored in the six engines of the model, one for each of the major provider groups in Egypt. These files are named:

- **mohengine.xls**: Ministry of Health engine
- **hioengine.xls**: Health Insurance Organization engine
- **ccoengine.xls**: Curative Care Organization engine
- **prvengine.xls**: Private sector engine
- **othengine.xls**: Other sector or provider engine
- **engine.xls**: General engine for demographic and other specific-purpose data sets not related to the five provider engines above. This file includes data for small providers not included in the above provider categories, such as teaching hospitals.

As noted, the *EgyptPro* program is not an empty shell like most available desktop software programs. It has been pre-loaded with large data sets for easy access.[23] However, users are not bound to use the pre-stored value sets, since each set can be modified, updated, changed or deleted as desired.[24] The data sets created in *Egyptpro* were required to model the Egyptian health sector and adequately answer any policy questions of interest. However, the model is not bound by its current structure and can evolve as additional data becomes available. Alternatively, it is possible to evolve the model through additions to the software to include, for example, a health outcomes module.

4.3.1.2 Menus and Outputs

Upon opening *EgyptPro*, users will see a blank work space screen and a status bar. This is the area where outputs from the model (i.e., reports) are displayed and published, for the purpose of report comparison and manipulation. The status bar informs the user what has taken place after a command has been executed. Instead of the standard Excel menu, there is a context-sensitive menu (described below) that remains on the top of the screen, unless the user chooses to switch menus to the Excel menu for advanced options.

The menu bar is the focal point of the software and is the area where the user drives the modeling program. There are four menus on the bar, and the features of each are as follows:

1. **Actions Menu**: Allows a user to run projections for a specified year, obtain last run status, get formulae for modeled elements, clean the user work area, print the reports in the work area, invoke the Excel menu, review user settings, and exit the program. The program works with a smart database connectivity routine which opens and closes required data files as needed by the program without requiring specific actions by the user.

2. **Data Organizer Menu**: Assists the user with display, modification or updating of raw data (parameters, arrays, and databases) associated with the model. This menu enables the user to list and view parametric and array data assumptions, assists in changing values of parameters for any year and in posting any database changes to the engines. The values accessed through this menu are hard coded numbers only, and do not include calculated figures, which have been part of a mathematical operation. The software does contain some arithmetic tools to calculate a data set, however, once a data set is created, it will become frozen rather than dynamic, and the user will not be able to modify it directly.

[23] Lists of the data loaded in the model are included in Annex 3.
[24] However, raw data sets cannot be deleted.

3. **Scenario Manager Menu**: Allows the user to open (load), create, update, save, or delete raw data sets (named scenarios) contained in the program. For example, any work developed using the "Data Organizer" menu could be defined as an individual scenario file for future access. If this work is not saved as a scenario, then it will not be available for use when the program is next accessed. A calibration tool is also available under this menu to optimize inputs for a desired policy outcome. The user can also compare scenarios to recall which parameters differ from one scenario to another.

4. **Report Writer Menu**: Opens available reports and facilitates optional tailoring of model outputs. Specifically, it enables the user to save current scenario outputs, delete any saved versions of scenario outputs, and access four kinds of reports:

   - Population-based reports (pivot tables)
   - General purpose reports (pivot tables)
   - Comparative and time-series reports (i.e., saved scenario outputs)
   - NHA reports (six fixed matrix tables; reports comparing outputs of two scenarios)

4.3.2 Installation and Operation of *EgyptPro*

To install *EgyptPro*, the user simply needs to run the self-extracting file **EgyptPro.exe**. The program is either installed by default in the directory c:\egyptpro or can be installed to the user's directory of choice.

Operation of the model typically involves use of its features to execute four functions:

1. Managing scenarios;

2. Data manipulation—viewing and changing data input for the scenarios and saving/storing them as named scenarios (including a baseline for a benchmark);

3. Running projections of scenarios; and

4. Viewing and printing reports of scenario outputs.

The following gives a brief description of the model operation for each of the above.

4.3.2.1 Managing Scenarios

The "Scenario Manager" menu is perhaps the most important tool available in the software, as it is used to consider various policy scenarios, which are of interest to the government or independent policy analysts.

Scenarios are defined as individual files created to save parametric and array-type assumptions, each carrying values different from the other. In simple terms, if at least one value for a particular year in a selected parameter, or the value of one unique record in an array is changed by the user, then the policy analyst is looking into a different option simulating a real-life situation. Each approach with even only one changed scenario is defined as a separate scenario.

There are two types of scenarios—policy scenarios and sensitivity analyses. Scenarios are not only useful for considering the effects of different policy options, but can also be used to test the sensitivity of a particular value on a selected result. However, in most cases, users will create a policy scenario to aid decision making.

Modeling a policy scenario can be as simple as changing one assumption within the base model, or it could require changing twenty parameters and ten array assumptions in order to realistically consider the effects of a policy change. The scope of the changes will obviously depend on the nature of the scenario.

Before undertaking scenario modeling, it is assumed that the user will have a general understanding of the Egyptian health system and the dynamic interactions of its various financial and economic characteristics as described in the conceptual framework and outlined in Section 3 of this document. This understanding is extremely important, simply because the user is not limited only to appropriate value changes – any value contained in the model can be changed using the software. However, it is important that the changes are informed ones. The software can produce any desired results, but if the inputs are not realistic, then the outputs will be unreliable and inaccurate.

For example, a policy option, which impacts a revenue element of the model, and depends on co-payments, should not omit assumptions pertaining to service demand if price effects are a known constraint. A payment system to medical providers should not overlook regional distribution of medical personnel, general input/output relationships, or efficiency measures. Increasing public funding should not overlook how revenue could be generated thorough increased premiums or improved compliance.

4.3.2.2 Scenario Creation and Data Manipulation

To create a scenario, the user must follow the following sequence of steps:

1. Identify the purpose and scope of policy or program changes,
2. Determine which parameters and arrays are likely to be explanatory in the scenario being considered,
3. Determine for which years which values should be changed, and to what they should be changed,
4. Change parametric values by either of the methods defined in the "Parameter Value Set-Up Assistant,"
5. Change array-type values for selected records in every relevant array,
6. Choose "Save Scenario" and type in a name for your scenario.

Once a user has performed these steps and has saved the file, a new scenario will be stored in **scen.xls**, and the new name will appear in all scenario options for updates and reporting purposes.

Steps 1 through 3 above are typically executed by the user/analyst in off-model analyses and calculations. These steps are particularly important in the specification of growth in service use rates by provider (which needs to be normalized because the growth rates modify percentage shares) and

for specification of efficiency factors to adjust total costs to reflect the fact that average costs are a poor proxy for marginal costs in their calculation.

There are three types of data serving as inputs in the model:

> Parameters or parametric assumptions;

> Array-type data sets; and

> Raw data sets (database).

Raw data compiled from the EHHUES comprise the foundation of the model. These data are the 1995 values for the 42 variables entered in the file **xnhadbn.xls**. Parameters or parametric assumptions are data, which can change over time; there is one value for each of the thirty years encompassed by the model (1991-2020). Array-type data are constants which do not vary over time, but which may vary across demographic groups (and/or provider types) in the population. These three types of data are described in detail below.

4.3.2.3 Parameters and Parametric Assumptions

Parameters and parametric assumptions are sets of data with one value per year of the model, or (1 X 30) matrices where 30 represent the time span for projections, from 1991 through 2020. For example, a population point estimate parameter as defined for Egypt would take the form of:

1991	56,000
1992	58,000
1993	60,000
1994	62,500
—	—
—	—
—	—
2020	92,000

Parameters can be changed for any year by invoking the “Parameter Value Set-up Assistant” in the “Data Organizer” menu. The set-up assistant allows the user to define parametric values by applying some simple calculation tools. The tools available to define parameters over time are:

1. Constant method

2. Linear growth rate method

3. Geometric growth rate method

4. Apply growth rate from a start year

5. Manual setting

Setting the values of the parameter in the model is a very simple procedure, as the “Parameter Value Set-up Assistant” prompts the user through three steps. In most cases, users are required to enter an initial and a final year for the projection and the point estimate values for selected years, and

the "Set-up Assistant" works out the values for the years in between. Different methods can be applied to a single parameter between particular years, or different rates of growth can be imputed for the same parameter for different initial and final years. This menu option is particularly important for modeling policy scenarios through changing assumptions.

4.3.2.4 Array-Type Data

An array-type data set is a (n x 2) matrix, where *n* represents the number of unique records for the array. One of the fields is used to define the records and the second field contains the value of the record. An example of an array type data set is the average length of stay assumption by age group for HIO:

Age	HIO ALOS
0-5	5.2
6-18	2.1
19-49	7.8
50+	15.2

The difference between a parameter and an array is that array-type data sets do not include a time dimension. A parameter is one value with one dimension for one year, which can change when projected over time. An array contains more than one dimension in any and all years. To define an array data set over time, one must multiply it with a parameter or an array of growth rates with identical matrix dimensions. Array-type data do not generally need to be changed from one scenario to another since they typically represent fixed values inherent in the organization and operation of the delivery system. However, they can be treated as weights and modified by the calibration tool if an analyst wishes to back-solve for a result using array-type data as an input.

4.3.2.5 Database

A database is defined as a data set consisting, for each variable, of (m x n) dimensions, where *m* represents the number of fields defining a unique record and *n* represents the number of unique records within the field. The number of database fields in this model is five (age, sex, region, income, and insurance status); while the number of unique records in 240.[25] For instance a service rate of use for hospital admissions database is depicted as:

Age	Sex	Region	Income	Ins_Status	Hosp.Adm.Rate
0-5	Male	Urban	Q1	Yes	7.52%
0-5	Female	Urban	Q1	Yes	6.89%
—	—	—	—	—	—
—	—	—	—	—	—
50+	Female	Rural	Q5	No	3.20%

[25] The number of unique records is usually less, e.g., three, when the value available varies only by region.

In this example, the five database fields are used for the five available population dimensions. To review what was discussed earlier, the number of unique records in each database field is:

Age	**Four** - 0-5, 6-18, 19-49, 50+
Sex	**Two** - female, male
Region	**Three** - governorates, rural, urban--representing metropolitan areas, Lower Egypt and Upper Egypt respectively
Income	**Five** - income quintiles Q1 (poorest), Q2, Q3, Q4, Q5 (richest)
Insurance Status	**Two** - yes (insured), no (uninsured)

The resultant database therefore contains **4 x 2 x 3 x 5 x 2=240** unique records.

The user could change the data in the raw databases, and such data should be updated to generate a new base year for the model whenever a new household survey is completed. However, until then, the user should consider the data, which is linked to other data in the array-type data and the parameters, to be fixed for the 1995 base year for the model.

As will be discussed below, there are many elements of the extended NHA, which cannot be estimated by the model, because of the lack of data. Examples are spending by private firms for health benefits of their employees, payments by private health insurance companies, and contributions to various provider groups by bilateral and multilateral donor groups. These data points are essential parts of the NHA and need to be specified by the analyst using off-model estimates when creating scenarios.

4.3.2.6 Calibrating Data: Calibration and Policy Goal-Seeking Tool

The calibration and policy goal-seeking tool assists policy analysts in finding possible optimum solutions in order to explain known facts. It is not designed to find a single optimum solution for a linear programming question. However, users will find it useful to vary the assumptions of the models to reach a desired target value. Users can specify a target value for a dependent variable and make one of the independent variables an unknown. By rearranging the equation and backsolving, given assumed values of other independent variables, the "Calibration Wizard" produces the target value, which would produce the desired value of the dependent variable. This is the tool used to calibrate unit cost data to generate the expenditure totals reported in the 1997 report of the 1995 Egyptian NHA.

The "Calibration Wizard" in the "Scenario Manager" requires four inputs from the program user:

1. A selection from a list of parameters;

2. A selection from a list of arrays (independent values);

3. A result set or target, called the dependent cell; and

4. A calibration year.

The wizard employs a simple mathematical logic. The model will always calculate a projected value (output) regardless of the value of inputs, following simple rules of *induction.* However, if the policy analyst wishes to set the output to a desired value by changing a selection of independent inputs, the rule will follow *deduction* and the independent values will act as weights rather than

absolutes. This latter technique can prove very useful for situations where the policy analyst is unable to obtain input data but already knows the outcome. The calibration can be performed in an iterative fashion to set appropriate weights between inputs, or alternatively shadow inputs can be assigned from relativities obtained from a similar data set.

As an example, in the case of Egypt, data on resource costs for labor and non-labor related inputs of health facilities were not available for any health care providers other than the Ministry of Health—for which data was only available for a limited number of health facilities. However, total labor-related outlays, or total recurrent expenditure data were available for most providers. Assuming that the relativities applied to the MOH (i.e., doctor/nurse salary ratio) are applicable to other providers, the user could calculate input labor and non-labor unit costs for all other providers in the health sector. To do this, shadow costs are first assigned to other providers using MOH data and the calibration tool is used to calculate the right inputs based on MOH weights. The calibration resulted with a different set of parametric and array values and these values were then updated to the base case (status quo) scenario.

4.3.2.7 Running Projections

After a chosen scenario has been saved and loaded, while in the "Scenario Manager," the user then switches to the "Actions" menu and clicks on "Run Projections (specify year)." After the target year is selected and the projection run has been completed, the model is ready to produce reports for the scenario outputs for that chosen year.

4.3.2.8 Writing Reports

Reporting tools are designed to assist the analyst for presenting data in various forms. There are a number of considerations that were taken into account when designing the report writer:

1. A different set of reports can be prepared for each scenario. In order to access reports for a particular scenario, the user must load that scenario before using the report writer.

2. Comparison of scenario results can also be prepared as a report, including an option for a report containing time series data. This type of report requires projection runs for each year or each scenario to be included in the report.

3. The dimensions of reports can be changed in report layout. For example, service use by age and sex or, region and income, or all of this information can be cross-tabulated in various row, column and page settings.

4. The six NHA matrices, as discussed in Section 3, have been made available for quick access, under the option entitled NHA Tables. In addition, the user may compare outputs of one scenario with those of another. This is especially useful if one scenario is considered a benchmark (e.g., a baseline projection of the status quo in law, program, and policy) against which other scenarios can then be measured.

The six menu options available under the Report Writer main menu are:

> Save current scenario outputs

> Delete saved version of scenario outputs

- Population based reports
- General purpose reports
- Comparative and time series reports
- NHA reports
  - Standard (extended) reports (six)
  - Reports comparing two scenarios

The first two options, which deal with scenario output, are designed to write and delete reports for comparative and time series analysis. The advantage of using this menu option is to eliminate projections (backcast/forecast) run. Comparative reports only contain high-level data, such as running totals of various entities modeled. Therefore the user does not need to run projections prior to accessing these reports. This is possible because of the low level of detail contained in these reports. For example, the reports will not show hospital service use by age and sex, only in total. For reports with greater detail, the menu option "Population Based Reports" should be used. Also, the comparative reports do not contain other dimensions such as expenditures by line items. General purpose reports (the fourth menu option) caters for this purpose.

Finally, NHA reports show the "big picture," including the elements which do not require elaborate modeling. For example, donor-funded health expenditure is parametrically defined. It is not as complex as the elements of the model, which contain population dimensions using the service or the input resource costs on how the monies are spent. However, this information is needed for looking at total flows in the system. NHA reports are designed to cater for this purpose.

Note that, for each NHA report, all rows and all columns add up to the same total expenditure sum. The exception to this rule is of course the matrix, which displays service utilization information rather than expenditure data (see Table 4.6).

4.3.3 Documentation of *EgyptPro*

The ***EgyptPro*** software and its complete documentation (of both Version 1.0 and Version 1.1) can be found in the report, *"Health Pro – Egypt: Egypt Health Sector Finance Reform Model, Technical Documentation,"* submitted by the HIC in 1999. Interested readers can request this report from PHR. The annexes to this report include listings of the data and modeled elements in ***EgyptPro.*** These are:

1. Data inputs and outputs
2. List of parameters, arrays, and databases
3. List of model objects
4. Report objects (calibration results list)

4.4 Calibration of the Model to Egypt's 1995 National Health Accounts

4.4.1 Rationale for Calibration

The development of the conceptual framework and specification of this model envisioned two calibration exercises to link the work with the two existing calculations of Egyptian NHA: one for the year 1995 and one for the year 1991. The first calibration was designed to align critical parameters of the model so that the 1995 base year data would, in fact, generate the NHA output for that year which was reported in the 1997 DDM report (Rannan-Eliya, et al., 1997). In addition to calibrating the data and parameters to those findings, the model was structured to calculate extended national health accounts. "Extended NHA" refers to the ability of the model to generate additional report formats on services provided and resources used, as well as the standard reports on expenditures and financial flows.

The second calibration envisioned was a "back projection" exercise, focused on modeling the impact of the School Health Insurance Program (SHIP). This exercise was to commence from 1995 after SHIP was introduced[26], for which detailed NHA was available, and backcast the results to estimate the 1991 NHA before SHIP was introduced. The purpose of this exercise was to estimate the impact of SHIP by calculating what NHA would have been in 1991 had SHIP been in effect at that time, and compare it to what it actually was in 199l. However, after further investigation, it was determined that this second calibration exercise was not feasible. Since the 1991 NHA data were limited and not sufficiently comparable to the 1995 NHA data, a meaningful result could not be generated.

The first calibration was done as specified, and the process is described in the following section. The 1995 NHA have been reproduced using the more detailed and disaggregated model process, producing the six matrices illustrated in the following section. Of the six matrices, only two were calculated for the 1997 DDM report. The other four matrices show the additional, extended output available through this integrated model. In addition to the NHA matrix output and to the model's ability to project future values of the cells of these matrices, the model has additional beneficial uses. For instance, the model is able to generate reports comparing any scenarios to a baseline projection (described below) as well as general and population-based reports on the full variety of cost and use data which are the foundation of the model.

[26] SHIP was introduced in 1993.

4.4.2 Data and Methods

Prior to calibration to the 1997 report on the 1995 NHA, *EgyptPro* generated results for the NHA tables based on the data from the EHHUES and the modeled elements using that data.[27] Where *EgyptPro* did not have data to estimate a cell in the NHA tables, the data appearing in the 1997 report was accepted and entered into *EgyptPro* as a parametric assumption (the result of an off-model estimate). Most of these cells involved financial flows from and to private sector entities. Most of the other NHA cell estimates calculated by *EgyptPro* came within ±10 percent of the data in the 1997 report. The model's "Calibration Wizard" was used to adjust one of the independent variables in the formula generating cell results. In most cases, the variable adjusted was average cost as service utilization was obtained from the survey while most average costs were proxied. These resource unit cost estimates had been based on data from 1993/94, and had been inflated, using price deflators from the 1997 report.

The grand total of health sector expenditures was set at LE 7,529 million, slightly more than the LE 7,516 that was published in the 1997 report. This correction of LE 13 million was accounted for by an increase of LE 10 in estimated spending by the HIO and by an increase of LE 3 million in spending by the MOH. In addition to these adjustments, the format of the NHA tables was altered slightly as follows:

Sources of Financing:

> The category of Social Insurance Organization (SIO) was eliminated by assuming that its function of receiving and remitting (to the Ministry of Finance [MOF]) the HIO premiums paid by employers and employees would be subsumed within the category for the MOF.

> The categories of "firms" and "syndicates" were collapsed into one category labeled "employers."

> An additional category called "financing deficit or excess" was included to identify any gap between regular revenue sources and program/service costs.

[27] Data sources used for modeling of the health sector were listed in Section 3 and in the discussion of individual data elements. The data elements listed below were used in the calculation of the matrices, and the sources from where they were extracted. The last two sources form the basis of calibrations.

1. Population and health labor force: Point Estimates by CAPMAS and World Bank, Ministry of Health and Population, Egypt Health Sector Reform Program
2. Health service utilization by provider, out-of-pocket health expenditure: Egypt Household Health Expenditure and Utilization Survey 1995 (EHHEUS 1995)
3. Input Output Arrays and Resource Costs for Hospital In-patient Care: Hospital Surveys (Bani Suef, Suez Base, Alexandria)
4. Input Output Arrays and Resource Costs for Ambulatory Medical Care and Public Health Services: Health Units Survey (19 Health Facilities)
5. Expenditure, and Price Indices: National Health Accounts of Egypt 1997
6. Population (Insured) Revenue and Expenditure: A Reform Strategy for Health Insurance Organization

Financing Agents:

> The categories of teaching hospitals (THIO), the Ministry of Education (MOE), the Ministry of Social Affairs (MOSA), and "other ministries" were collapsed into one category labeled "other ministries and public providers."

> The categories "syndicate schemes' and "private insurers" were collapsed into one category.

> The categories of MOF and Households were added in order to include the ability to include amounts "not transferred to intermediaries (financing agents)" within the same table.

Associated with some of the above changes are several methodological differences with the 1997 report.

1. The 1997 report has LE 434 going from MOF/NIB to HIO. This included the government's contributions for its share of SHIP premiums, revenues for SHIP from the cigarette tax, and "other operational revenues." Cigarette taxes were transferred to the "households" source category, leaving LE 121 million in SHIP premiums in the MOF source category, and LE 69.8 million in the deficit category (financed by "other operational revenues").

2. The published amount of LE 448 from the SIO to HIO in the 1997 report was distributed between "employers" (a new source category) and "households" (because the SIO category was eliminated). The "employers" amount of LE 322 million includes their share of the premiums for Law 32 and Law 79 coverage, for payments required of "companies with waivers" who decline coverage, and labor accident insurance premiums. The "household" amount of LE 418 million includes cigarette tax payments as well as SHIP premiums, employees' shares of the Law 32 and Law 79 premiums, and co-payments made for services received.

4.4.3 Calibration Results

4.4.3.1 Standard NHA Tables

Of the six NHA tables produced by *EgyptPro*, two are designed to be similar to the two standard tables published in the 1997 report. Table 4.1, "Financial Flows from Primary Sources to Financing Agents, NHA Egypt, 1995," is the same (with the above adjustments) as source Table 1.1, "Financing Flows, Egypt FY94/95 - Sources to Financing Intermediaries," in the 1997 report.[28] Table 4.2, "Financial Flows from Financing Agents to Providers, NHA Egypt, 1995," is the same (with adjustments as noted) as source Table 1.2, "Financing Flows, Egypt FY94/95 - Financing Intermediaries to Providers", in the 1997 report.[29]

[28] "Egypt National Health Accounts, 1994-95," p. 4.
[29] "Egypt National Health Accounts, 1994-95," p. 5.

Table 4.1: Financial Flows from Primary Sources to Financing Agents, NHA Egypt, 1995 (in millions)

Financing Agents	Primary Sources				Deficit/ Excess	Total	Percent, Rows
	MOF	Households	Employers	Donors			
MOF	£46					£46	1%
MOH	£1,340			£142		£1,482	20%
HIO	£214	£395	£322	£12		£943	13%
Firms			£364			£364	5%
Households		£3,780				£3,780	50%
Other ministries	£810					£810	11%
Private insurers/syndicates			£43			£43	1%
Donors				£61		£61	
Total	£2,410	£4,175	£729	£215	£0	£7,529	100%
Percent, Columns	32%	55%	10%	3%	0%	100%	

Note that the row totals for financing agents in Table 4.1 are equal to the column totals for financing agents in Table 4.2 because they are the same entities, with their spending totals broken down in two different ways. Table 4.1 shows where the money comes from, and Table 4.2 shows which providers it goes to, and how much.

Table 4.2: Financial Flows from Financing Agents to Providers, NHA Egypt, 1995(in millions)

Providers	Financing Agents								Total	Percent, Rows
	MOF	MOH	HIO	Firms	Households	Other Ministries	Private Insurers	Donors		
MOH Facilities		£1,308	£17		£80				£1,405	19%
HIO Facilities		£1	£530		£49				£580	8%
Other Ministries		£59	£67	£224	£54	£810	£1	£36	£1,251	17%
Private Hospitals		£42	£71	£23	£120		£25		£281	4%
Private Clinics				£57	£670		£10		£737	10%
Pharmacies		£17	£237	£60	£2,396		£6		£2,716	36%
Mosques					£341				£341	5%
Other providers	£46	£55	£21		£70		£1	£25	£218	3%
Total	£46	£1,482	£943	£364	£3,780	£810	£43	£61	£7,529	100%
Percent, columns	1%	20%	13%	5%	50%	11%	1%	1%	100%	

4.4.3.2 Extended NHA Tables

The following four tables are presented for the first time, as data on the Egyptian health system which both reflects its reality and is consistent with the previous assessment of Egypt's 1995 NHA, as published in the 1997 report.

Table 4.3 shows Financial Flows from Financing Agents to Functions, Egypt, 1995, with functions defined as inpatient care, outpatient care, public health, contracted services, and other. The distribution of financial flows by end-use function, as shown in this table, is reflective of the

definitions of functions, which, to some degree, is arbitrary. The large amount of out-of-pocket spending in public health is a result of classifying visits to mosque clinics as public health. Classifying such visits as ambulatory care would result in a very different distribution.

Table 4.3: Financial Flows from Financing Agents to Functions, NHA Egypt 1995 (in millions)

Functions	Financing Agents								Total	Percent, Rows
	MOF	MOH	HIO	Firms	Households	Other Ministries	Private Insurers	Donors		
Inpatient Care		£634	£240	£23	£203	£541	£25		£1,666	22%
Ambulatory		£216	£528	£117	£2,773	£269	£16		£3,919	52%
Public Health		£458			£773				£1,232	16%
Contracted Services		£174	£175						£349	5%
Other	£46			£224	£30		£2	£61	£363	5%
Total	£46	£1,482	£943	£364	£3,780	£810	£43	£61	£7,529	100%
Percent, Columns	1%	20%	13%	5%	50%	11%	1%	1%	100%	

Spending patterns of the main three financing agents in Table 4.3 indicate that the majority of spending is for ambulatory care services, not for hospital in-patient care services. This is true largely because households (accounting for half of all spending), spend about two-thirds of that on ambulatory care.

The choice to amalgamate all non-MOH public providers under the "other ministries" category (as financing agents and providers) is based on the way EHHEUS' responses were designed. The survey classification of provider response categories was as follows:

Hospital (Inpatient care):

> Ministry of Health

> Health Insurance Organization

> Curative Care Organization

> Private hospitals

> Other hospitals

Ambulatory Medical Care (Outpatient care):

> Ministry of Health hospital based outpatient clinical services

> Health Insurance Organization

> Clinical Care Organization and Other Government

> Teaching Hospital Organization

> Private clinics

Public Health Services (Primary Health Care Outpatient):

- Ministry of Health non-hospital clinics (Urban and Rural Health Centers, Mother and Child Health Centers)
- Mosque contacts[30] (assumed to provide services similar to Western Medicine)
- Pharmacy contacts (excluding out-of-pocket spending to purchase pharmaceutical drugs)
- Other contacts (other non-hospital public facilities)

While separation of these provider categories was possible for the NHA reports showing flows from providers to functions and providers to line items (see Tables 4.4 and 4.5), no structured way of mapping these categories to Tables 4.2 and 4.3 was identified. For instance, it was not possible to ascertain whether ambulatory medical contact responses of Clinical Care Organization and Curative Care Organization represented the same provider entity. Nevertheless, the two response categories were not combined under one CCO heading, as the former category included ambulatory activities of other government providers as well.

Similarly, despite the fact that teaching hospitals provide hospital in-patient care services, they were defined as "Other Hospital" in the survey. For the purposes of Tables 4.2 and 4.3, these discrepancies are irrelevant if "other ministries (other public)" is defined both as a financing agent and a provider category.

The "contracted services" category in Table 4.3 depicts the amount of money spent by each financing agent to purchase health services from other providers, where the breakdown of figures is taken from the 1997 NHA report. Data values have been parametrically defined in the model.

Table 4.4, "Financial Flows from Providers to Functions, NHA Egypt, 1995," translates the service use figures in Table 4.6 into expenditures, including flows which cannot be traced directly to services such as contracted services, flows from firms and private insurers and syndicates (also reported in Table 4.3). The main function of Table 4.4 is to account for flows from households to providers under the functions where out-of-pocket funds are spent.

[30] These contacts could be classified as ambulatory care visits, and would alter Table 4.3 results as such.

Table 4.4: Financial Flows from Providers to Functions, NHA Egypt, 1995 (in millions)

Providers	Health Services Settings				Total	Percent, Rows
	Inpatient Care	Ambulatory Care	Public Health	Other		
MOH facilities	£682	£221	£485		£1,388	18%
HIO facilities (excluding pharmacies)	£246	£334			£580	8%
Other public providers						
CCO hospitals	£46				£46	1%
Teaching hospital clinics		£79			£79	1%
Other govt. clinics		£213			£213	3%
Other hospitals	£509				£509	7%
Other clinics			£18		£18	0%
Mosques			£332		£332	4%
Pharmacies	£15	£2,270	£356		£2,642	35%
Private Clinics		£737			£737	10%
Private hospitals	£281				£281	4%
Other-unallocated				£705	£705	9%
Total	£1,779	£3,853	£1,192	£705	£7,529	100%
Percent, columns	24%	51%	16%	9%	100%	

Table 4.5 shows "Financial Flows from Providers to Line Items, NHA Egypt, 1995." This table maps expenditure from providers to line items. In effect, this matrix represents the lowest level of summarization that is possible in the National Health Accounts context.

Table 4.5: Financial Flows from Providers to Line Items, NHA Egypt, 1995 (in millions)

Line Items	Providers											Total	Percent, Rows
	MOH	HIO	CCO Hospitals	Teaching Hospitals	Other Govt.	Other Hospitals	Mosques	Pharmacies	Private Clinics	Private Hospitals	Other		
Salaries-Total	£762	£197	£7	£55	£152	£276			£572	£149		£2,170	29%
Salaries-MDs	£151	£84	£3	£23	£63	£88			£203	£52		£667	9%
Salaries-Nurses	£172	£50	£1	£13	£38	£84			£169	£41		£569	8%
Salaries-Other staff	£439	£63	£3	£18	£50	£105			£199	£56		£934	12%
Drugs	£214	£163	£8	£10	£25	£64		£2,633	£99	£37		£3,252	43%
Medical Supplies	£114	£82	£7	£2	£5	£66			£21	£39		£336	4%
Food Supplies	£64	£36	£3			£44				£23		£170	2%
Other Recurrent Costs	£154	£101	£9	£6	£15	£56			£46	£34		£421	6%
Not Allocated	£174	£175			£261		£341				£229	£1,180	16%
Total	£1,482	£755	£35	£73	£457	£506	£341	£2,633	£737	£281	£229	£7,529	100%
Percent, columns	20%	10%	0%	1%	6%	7%	5%	35%	10%	4%	3%	100%	

Classification of line items is based on a *labor* and *non-labor* related expenditure division, as is reflected in the modeling process described in Section 3. Under labor-related outlays, payments to doctors, nurses and technical and other staff are considered. Expenditure on drugs, medical supplies, food and other supplies (and recurrent costs) are included in the non-labor-related expenditure category[31]. The line items have been modeled separately for each provider health institution, as discussed in Section 3. The figures in this table are based on individual input/output arrays for each resource input and resource costs per unit of service.

As data on human resources employed in mosques, pharmacies and other providers are not available, labor-related line item costs for these providers have not been separated from total costs. It has been assumed that household out-of-pocket spending for services provided by these institutions would pay for official/unofficial earnings of personnel delivering these services. As data are available for out-of-pocket spending from the survey, no double counting of expenditure occurs once line item costs are excluded in this exercise.

A further assumption is that the relative resource inputs and costs obtained from the largest provider, the Ministry of Health, can be applied to the other provider categories in the health sector. As in most sectors of the economy, earnings of staff with the same qualifications vary across different organizations. Most important for this exercise, however, is relative earnings of a doctor compared to a nurse, working for a particular institution or relative earnings of a doctor working in a rural health facility vis-à-vis an urban or a metropolitan health facility.

Similarly, average drug or medical supplies cost per day of stay in a rural hospital compared to an urban hospital is more informative than the actual amount being spent by the facility. Therefore, it is the relativities of resource costs, rather than the actual values that are important for the model.

Total expenditure on pharmaceutical drugs in Egypt was used as a point of calibration. The drug items line in Table 4.5 gives expenditures on drugs as LE 3,252 million, including retail drug sales and facilities expenditure. According to Table 2.31 "Drug Sales between 1986 and 1996" in the 1997 NHA report, the retail value of drug sales was LE 3,134 million in 1995, which excludes the facility expenses of approximately LE 605 million (as per Table 2.32 of the same source). The drug expenditure estimates generated by the model were not calibrated to these figures, however, as the accompanying notes to the tables suggested a crudeness of approximation. Furthermore, there are often inclusion and exclusion errors with respect to medical supplies costs. Together with the estimated LE 336 million expenditure on medical supplies, the drug expenditure estimate comes closer to the figures depicted in these tables. Drug unit cost and cost growth assumptions are defined for each provider and function in the Egypt Health Sector Reform Model. Once again, the software that contains the model has been designed to allow the user to smooth this type of variation once additional data become available.

Table 4.6 shows "Health Services Use by Providers, NHA Egypt, 1995," which underlies the revenue and expenditure data in the other tables. This table is a particularly useful output of the extended NHA because it reports utilization data by provider which is generally not available without considerable research, and is presented as being consistent with revenue and expenditure data in the other tables. The cells in this table are filled by the quantity component of the (quantity X price) expenditure function that is depicted in the other matrices.

[31] Food is only a relevant line item for hospital-based inpatient services.

Table 4.6: Health Services Use by Providers, NHA Egypt, 1995

Providers	Health Services Functions							
	Inpatient Admissions		Occupied Bed-days		Ambulatory Visits		Public Health Visits	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
MOH Clinics							17,872,491	42%
MOH Hospitals	824,742	58%	9,189,095	53%	22,601,992	14%		
HIO Clinics					15,376,331	9%		
HIO Hospitals	205,775	14%	1,031,436	6%				
CCO Hospitals	21,449	1%	216,353	1%				
Teaching Hosp Clinics					6,003,902	4%		
Other Government					15,627,335	10%		
Other Hospitals	189,690	13%	5,607,068	32%				
Mosques							14,661,636	34%
Pharmacies							6,501,329	15%
Private Clinics					104,784,673	64%		
Private Hospitals	189,690	13%	1,254,668	7%				
Other Clinics							3,632,800	9%
Total	1,431,346	100%	17,298,620	100%	164,394,233	100%	42,668,256	100%

5. Using the Model: Analytical Framework and Results

This section explains how to use the model to provide policy-relevant information to decision makers in the health sector. Two processes are described:

- **The development and estimation of a baseline projection**: The analyst may use the model to estimate the levels of expenditures and revenues which, in future years, are most likely to be experienced by the major actors in the health sector. In the process of estimating the baseline projection, the analyst can become familiar with the relative importance of various assumptions underlying the projection, and have a benchmark against which to compare scenarios, which postulate alternative policies.

- **The development and estimation of policy scenarios**: Once the analyst has developed multi-year baseline projections of expenditure and revenue levels under current law, the analyst can model policy scenarios by changing the assumptions. The assumptions would be expected to change if policies were changed in order to see how the expenditure and revenue levels would change as a result.

In addition to providing the aggregated flow of funds data related to revenue and expenditure amounts experienced by the major entities of the sector (e.g., primary sources of funds, financing agents, and provider groups), the model allows the analyst to examine the disaggregated features of cost and use of, as well as payment for, health services. The model, based on survey data calculated for up to 240 separate demographic categories, enables the analyst to "drill down" into the data to discover distributional impacts on both the cost side and the benefit side, and across several demographic dimensions (such as age, sex, income, and region).

5.1 The Baseline Projection: Analytical Framework and Estimation

5.1.1 The Baseline as Benchmark

Analysis of health policy options using this model begins by asking the question: "**what** would be the consequences **if** current policy X were changed to new policy Y?" To answer such a question, the analyst would seek to measure such an impact (in some specified future year) by estimating the difference (in that year) between the following two amounts:

1. A measure (estimate) of "what **would be** the case…if new policy Y were in place, instead of the current policy X," and

2. A measure (estimate) of "what **would have been** the case …if current policy X were continued as it is implemented at present.

Policy X is the current policy and policy Y is the contemplated policy. Measures of case (1) and case (2) would be, in essence, projections into some future year based on knowledge about past trends and relationships, which would either be built into the model or are entered as parameters.

The first step in the analysis would be to estimate future values of the various dimensions of X. These future values constitute a baseline projection of current law and policy. These future values of various elements of the model would comprise a best estimate of what they would be if future law and policy remained unchanged from what it is today (or in the base year of the model--the last year for which the model has entered actual data).

The next step in the analysis would be to characterize any proposed change in law to policy Y in terms that can be entered into the model. Examples would be: (1) a change in enrollment in an insurance program; (2) a change in co-payment rates required of insured patients; or (3) a change in cost structure or prices charged for services.[32] After entering these new values for parametric assumptions into the model, running the program would generate a projection of "future values" which would most likely differ from the future values in the baseline projection.

The last step in the analysis is to determine the difference, for the variables of interest, between the future values in the first step (projection of baseline) and the future values in the second step (projection of the proposed policy). This difference is the analyst's estimate of the impact of the proposed policy.

For NHA, the variables of primary interest are the values of the cells of the various matrices as well as the row and column totals, which capture the estimated flow of funds. Tables of primary interest showing the aggregate flow of funds (during the year specified) from sources to uses through financing agents are (data shown for the 1995 base year):

- Flows from primary sources to financing agents (Table 4.1)
- Flows from financing agents to providers (Table 4.2)

In addition, the integrated model can generate three additional tables, which, in the absence of the disaggregated data and the model itself, are extremely difficult to create. These are the tables showing (for the year specified):

- Flows from financing agents to functions (Table 4.3);
- Flows from providers to functions (Table 4.4); and
- Flows from providers to line items (Table 4.5).

Finally, the integrated model is able to generate one table showing the utilization levels for the various providers. Table 4.6 "Health Services Use by Providers" illustrates four types of utilization data (inpatient admissions, occupied bed-days, ambulatory visits, and public health contacts) according to provider type and setting. The structure and operation of the model ensure that the estimates of future costs/expenditures are consistent with the estimates of underlying resource use by provider. The linkages between the physical resource module and the financial resource module are the input/output values of the relevant parameters—input/output ratios and efficiency factors for each of the three types of staff (physicians, nurses, and others).

[32] All estimated projections of baseline and scenarios are in nominal prices.

In order to illustrate how the model can facilitate analyses and how it actually works, two different policy scenarios have been postulated and estimated below. Each of these scenarios, and how they were modeled, is described in greater detail below. Prior to discussing the scenarios, however, how the baseline projection was developed and the results of the estimated projection for the year 2000 are described.

5.1.2 Estimating a Baseline Projection through 2000

5.1.2.1 Assumptions

Since the process of using this model is inherently iterative, requiring multiple runs before arriving at the final estimation, an illustration showing the model's results of two sequential runs, Baseline A and Baseline B, is useful. This two-stage presentation is mostly a heuristic device to show the effect of entering only some of the assumed values in the model in a first run, and the effect of then entering the rest of the assumed values in the second run. All values could have been shown as having been entered at once. But this two-step presentation makes the whole process somewhat easier to comprehend. The basis for the actual values used for the assumed parameters is explained in detail in the Annexes.

First, to generate Baseline A, values for the assumed growth rates in the major determinants of cost and use of health services are entered. This is done without changing any of the documented patterns of enrollment in various health plans, patient choices of provider, and/or changes in efficiency of service delivery or in marginal costs. Thus, Baseline A assumes no changes in health plan enrollment, distribution of visits among provider types, or in efficiency of production over the years of the projection.

Second, after viewing the results of the first step above (Baseline A), Baseline B is generated by entering best estimates of assumed growth rates in the proportions using the different providers, in provider-specific use, and provider-specific efficiency in production. Baseline B therefore reflects the analyst best guesses about two additional changes in health-seeking behavior of consumers: (1) changes in health plan enrollment and (2) changes in the distribution of service by provider type over the projection period. These assumed changes lead directly to changes in service use and, also, to changes in efficiency parameters.[33]

Table 5.1 shows the assumed values entered in each of these two steps. A detailed explanation and justification for these assumptions is provided in Annex 1 and Annex 2.

[33] The numbers entered as "efficiency parameters" were those adjustment factors needed to adjust total costs to reflect the fact that changes in total cost should be incremental change in use times marginal cost (not average cost). Because fixed costs are a higher portion of total costs of inpatient service production (as compared to those of outpatient service production), marginal costs were assumed to be 50 percent of average inpatient costs and 25 percent of average outpatient costs. (No real changes in efficiency were assumed.)

Table 5.1: Parametric Assumptions: Baseline A, Baseline B, and Scenarios, NHA Projection Model, 1995-2000

Variables	Assumed Yearly Growth Rate in Variable, 1995-2000	
	Baseline A	Baseline B
Population	1.9%	1.9%
Disposable income per capita	8.0%	8.0%
Employment	1.9%	1.9%
Price inflation in…		
Provider salaries	8.0%	8.0%
Provider services	8.0%	8.0%
Provider inputs (except drugs)	8.0%	8.0%
Drugs, public sector	8.0%	8.0%
Drugs, HIO	10.0%	10.0%
Drugs, private clinics and hospitals	12.0%	12.0%
Rate of utilization of		
Hospital services	0.5%	0.5%
Ambulatory care services	1.0%	1.0%
Choice of provider/provider-specific use		
Hospital services/1		
MOH	0.0%	-0.759%
HIO	0.0%	1.750%
CCO	0.0%	0.000%
Private	0.0%	2.250%
Other	0.0%	-0.759%
Ambulatory care services/2		
MOH hospital outpatient	0.0%	-1.000%
MOH health units	0.0%	-1.000%
Teaching hospital outpatient	0.0%	-2.170%
HIO outpatient	0.0%	1.750%
Other govt. outpatient	0.0%	-2.170%
Private clinics	0.0%	2.250%
Pharmacies	0.0%	0.000%
Mosque clinics	0.0%	-2.170%
Other outpatient	0.0%	-2.170%
Labor efficiency/3		
Hospital services		
MOH	0.0%	-0.802%
HIO	0.0%	-2.015%
CCO	0.0%	-1.177%
Private clinics	0.0%	-2.249%
Other	0.0%	-0.802%
Ambulatory care services		
MOH hospital outpatient	0.0%	-1.391%
MOH health units	0.0%	-1.391%
Teaching hospital outpatient	0.0%	-0.514%
HIO outpatient	0.0%	-3.380%
Other govt. outpatient	0.0%	-0.514%
Private clinics	0.0%	-3.336%

Notes:

1. These rates are independent of the overall 0.5% yearly growth in admissions; rates are normalized as they are applied to percentage shares.
2. These rates are independent of the overall 1.0% yearly growth in visits; rates are normalized as they are applied to percentage shares.
3. These factors are set to adjust use of average cost data to approximate marginal cost data; actual changes in efficiency are assumed to be zero (for more information on how these rates were determined, see Annex 2.)

5.1.2.2 Baseline 2000 Projection: Results

Tables 5.2 and 5.3 show the results of model runs of Baseline A and Baseline B. Note that there is little aggregate difference between the two, although Baseline B is lower than Baseline A. The overall decline is due primarily to the fact that introduction of efficiency factors slightly outweighed the introduction of increases in enrollment and patient choices of provider.

The principal comparison to note is between Baseline B 2000 and Base 1995, which is the model's estimate (given the assumptions made) of the increase in expenditures on health in NHA components during the five-year period. Overall spending is projected to increase by LE 5.8 billion, a 77 percent increase, or about 12 percent per year. The largest increases in spending by financing agents (see Table 5.2E) are projected to occur in household (out-of-pocket) spending (89 percent), in spending by the HIO (87 percent), and in spending by firms (76 percent). Growth in outlays by the HIO is high because of increased SHIP enrollment, and by growth in drug prices, which also raises spending by households and firms. The largest increases in payments to providers (see Table 5.3E) are projected to be for pharmacies (104 percent), HIO facilities (79 percent), and private hospitals (79 percent). Growth in outlays by the MOH and other public providers are lower because their sources of revenue can restrain spending, despite input price increases, by reducing budgetary transfers.

Table 5.2A: Primary Sources to Financing Agents, Base, 1995 (in millions)

Financing Agents	Primary Sources					Total	Percent, Rows
	MOF	Households	Employers	Donors	Deficit/ Excess		
MOF	£46					£46	1%
MOH	£1,340			£142		£1,482	20%
HIO	£179	£395	£322	£12	£35	£943	13%
Firms			£364			£364	5%
Households		£3,780				£3,780	50%
Other ministries	£810					£810	11%
Private insurers/syndicates			£43			£43	1%
Donors				£61		£61	1%
Total	£2,375	£4,175	£729	£215	£35	£7,529	100%
Percent, Columns	32%	55%	10%	3%		100%	

Table 5.2B: Primary Sources to Financing Agents, Baseline A, 2000 (in millions)

Financing Agents	Primary Sources					Total	Percent, Rows
	MOF	Households	Employers	Donors	Deficit/ Excess		
MOF	£68					£68	1%
MOH	£2,268			£181		£2,449	19%
HIO	£228	£503	£520	£15	£425	£1,691	13%
Firms			£641			£641	5%
Households		£6,825				£6,825	52%
Other ministries	£1,354					£1,354	10%
Private insurers/syndicates			£76			£76	1%
Donors				£78		£78	1%
Total	£3,918	£7,328	£1,237	£274	£425	£13,182	100%
Percent, Columns	30%	56%	9%	2%		100%	

Table 5.2C: Primary Sources to Financing Agents, Baseline B, 2000 (in millions)

Financing Agents	Primary Sources					Total	Percent, Rows
	MOF	Households	Employers	Donors	Deficit/ Excess		
MOF	£68					£68	1%
MOH	£2,104			£181		£2,285	17%
HIO	£228	£503	£520	£15	£499	£1,765	13%
Firms			£641			£641	5%
Households		£7,133				£7,133	54%
Other ministries	£1,250					£1,250	9%
Private insurers/syndicates			£76			£76	1%
Donors				£78		£78	1%
Total	£3,649	£7,636	£1,237	£274	£499	£13,296	100%
Percent, Columns	27%	57%	9%	2%		100%	

Table 5.2D: Nominal Changes in Amounts, 1995-2000: Primary Sources to Financing Agents, Baseline B (2000) – Base (1995), (in millions)

Financing Agents	Primary Sources					Total	Percent, Rows
	MOF	Households	Employers	Donors	Deficit/ Excess		
MOF	£22					£22	0%
MOH	£764			£39		£803	14%
HIO	£49	£108	£198	£3	£464	£822	14%
Firms			£277			£277	5%
Households		£3,353				£3,353	58%
Other ministries	£440					£440	8%
Private insurers/syndicates			£33			£33	1%
Donors				£17		£17	
Total	£1,274	£3,461	£508	£59	£464	£5,767	100%
Percent, Columns	22%	60%	9%	1%		100%	

Table 5.2E: Percentage Changes in Amounts, 1995-2000: Primary Sources to Financing Agents, Baseline B (2000) – Base (1995) (in millions)

Financing Agents	Primary Sources					Total
	MOF	Households	Employers	Donors	Deficit/ Excess	
MOF	46.9%					46.9%
MOH	57.0%			27.6%		54.2%
HIO	27.4%	27.3%	61.5%	27.6%	1325.8%	87.2%
Firms			76.2%			76.2%
Households		88.7%				88.7%
Other ministries	54.3%					54.3%
Private insurers/syndicates			76.2%			76.2%
Donors				27.6%		27.6%
Total	53.6%	82.9%	69.7	27.6%		76.6%

Table 5.3A: Financing Agents to Providers, Base 1995 (in millions)

Providers	Financing Agents								Deficit/ Excess	Total	Percent, Rows
	MOF	MOH	HIO	Firms	Households	Other Ministries	Private Insurers/ Syndicates	Donors			
MOH facilities		£1,308	£17		£80					£1,405	19%
HIO facilities		£1	£530		£49					£580	8%
Other ministries		£59	£67	£224	£54	£810	£1	£36		£1,251	17%
Private hospitals		£42	£71	£23	£120		£25			£281	4%
Private clinics				£57	£670		£10			£737	10%
Pharmacies		£17	£237	£60	£2,396		£6			£2,716	36%
Mosques					£341					£341	5%
Other providers	£46	£55	£21		£70		£1	£25		£218	3%
Total	£46	£1,482	£943	£364	£3,780	£810	£43	£61		£7,529	100%
Percent, Columns	1%	20%	13%	5%	50%	11%	1%	1%	0%	100%	

Table 5.3B: Financing Agents to Providers, Baseline A, 2000 (in millions)

Providers	Financing Agents								Deficit/ Excess	Total	Percent, Rows
	MOF	MOH	HIO	Firms	Households	Other Ministries	Private Insurers/ Syndicates	Donors			
MOH facilities		£2,193	£25		£91					£2,309	18%
HIO facilities		£1	£945		£53					£1,000	8%
Other ministries		£87	£118	£395	£69	£1,354	£2	£46		£2,071	16%
Private hospitals		£62	£125	£41	£206		£44			£477	4%
Private clinics				£100	£1,166		£18			£1,284	10%
Pharmacies		£25	£441	£106	£4,558		£11			£5,140	39%
Mosques					£578					£578	4%
Other providers	£68	£81	£37		£103		£2	£32		£322	2%
Total	£68	£2,449	£1,691	£641	£6,825	£1,354	£76	£78		£13,182	100%
Percent, Columns	1%	19%	13%	5%	52%	10%	1%	1%	0%	100%	

Table 5.3C: Financing Agents to Providers, Baseline B, 2000 (in millions)

Providers	Financing Agents								Deficit/ Excess	Total	Percent, Rows
	MOF	MOH	HIO	Firms	Households	Other Ministries	Private Insurers/ Syndicates	Donors			
MOH facilities		£2,030	£25		£87					£2,142	16%
HIO facilities		£1	£979		£58					£1,309	8%
Other ministries		£87	£118	£395	£64	£1,250	£2	£46		£1,961	15%
Private hospitals		£62	£125	£41	£232		£44			£504	4%
Private clinics				£100	£1,148		£18			£1,266	10%
Pharmacies		£25	£481	£106	£4,921		£11			£5,543	42%
Mosques					£519					£519	4%
Other providers	£68	£81	£37		£103		£2	£32		£322	2%
Total	£68	£2,285	£1,765	£641	£7,133	£1,250	£76	£78		£13,296	100%
Percent, Columns	1%	17%	13%	5%	54%	9%	1%	1%	0%	100%	

Table 5.3D: Nominal Changes in Amounts, 1995-2000: Financing Agents to Providers, Baseline B 2000 – Base 1995 (in millions)

Providers	Financing Agents								Deficit/ Excess	Total	Percent, Rows
	MOF	MOH	HIO	Firms	Households	Other Ministries	Private Insurers/ Syndicates	Donors			
MOH facilities		£721	£8		£7					£737	13%
HIO facilities		£0	£449		£9					£459	8%
Other ministries		£28	£51	£171	£10	£440	£1	£10		£710	12%
Private hospitals		£20	£54	£18	£112		£19			£223	4%
Private clinics				£43	£478		£8			£529	9%
Pharmacies		£8	£244	£46	£2,525		£5			£2,827	49%
Mosques					£179					£179	3%
Other providers	£22	£26	£16		£33		£1	£7		£104	2%
Total	£22	£803	£822	£277	£3,353	£440	£33	£17		£5,767	100%
Percent, Columns	0%	14%	14%	5%	58%	8%	1%	0%	0%	100%	

Table 5.3E: Percentage Changes is Amounts, 1995-2000: Financing Agents to Providers, Baseline B 2000 – Base 1995 (in millions)

Providers	Financing Agents								Deficit/ Excess	Total
	MOF	MOH	HIO	Firms	Households	Other Ministries	Private Insurers/ Syndicates	Donors		
MOH facilities		55%	47%		9%					52%
HIO facilities		47%	85%		19%					79%
Other ministries		47%	76%	76%	18%	54%	76%	28%		57%
Private hospitals		47%	76%	76%	94%		76%			79%
Private clinics				76%	71%		76%			72%
Pharmacies		47%	103%	76%	105%		76%			104%
Mosques					53%					53%
Other providers	47%	47%	76%		47%		76%	28%		48%
Total	47%	54%	87%	76%	89%	54%	76%	28%		77%

5.2 Analyzing Policy Alternatives: Developing and Estimating Scenarios

5.2.1 Scenario Development

Now that an estimate of projected health sector expenditures for the year 2000 has been completed, there is a benchmark (Baseline B) against which to measure possible changes in health policy. To illustrate how the model can be used to estimate potential impacts of policy changes, policy proposals in two areas will be developed and estimated: (1) possible changes in financing of HIO, and (2) possible changes in programming by the MOH.

HIO and the MOH are major components of the health sector, both in terms of financing and in terms of service delivery. A major difference between them is that the HIO delivery system is separated from its financing system and is funded from multiple sources. The MOH is almost entirely budget-financed from general revenues, and combines financing and delivery functions within the same organization. In other words, the MOH must rigorously adapt its delivery system and services to keep its costs within the means made available to it through its budget. The HIO can, and does, run deficits, until the government makes it whole. For 1994, the annual operating deficit was estimated at LE 200 million (DDM, 1995), and for 1995 it was estimated at LE 70 million (Rannan-Eliya, et al., 1997).

5.2.1.1 HIO: Meeting the Need for Enhanced Financing of the SHIP Program

Table 5.4 shows the enrollment, revenue, and expenditure data of the HIO program in 1995 and how, according to the model, the Baseline B projection estimates that they will change by the year 2000. The table shows that HIO enrollment is expected to grow by 4.2 percent annually—more than double the yearly population growth of 1.9 percent. Within HIO, SHIP enrollment is expected to grow 5.0 percent annually, while non-SHIP enrollment is expected to grow at the rate of population growth (1.9 percent). Also, as summarized in Table 5.4D, while revenues from premiums and co-payments rise 39 percent (7 percent yearly), from LE 908 million to LE 1,266 million, expenditures are projected to grow even faster by 87 percent (13 percent yearly), from LE 943 million to LE 1,765 million. This would mean the HIO operating subsidies from the MOF would rise twelve-fold (68 percent yearly), on an accrued basis, from LE 35 million in 1995 to LE 499 million in 2000.

Table 5.4A: HIO Program Enrollment, 1995 and 2000 (in millions)

Eligibility Category	Year		Nominal Change	Percent Change	Percent Change Per Year
	1995	2000			
Law 32/79 & others	5.8	6.4	0.6	10.6%	1.9%
SHIP	14.9	19.0	4.1	27.6%	5.0%
HIO Total	20.7	25.4	4.7	22.6%	4.2%
SHIP as % of HIO	72%	75%			
Egypt population	59.0	64.8	5.8	9.9%	1.9%
HIO as % of population	35%	39%			

Table 5.4B: HIO Revenues by Source, 1995 and 2000 (in millions, accrual basis)

Source of Revenue	1995	2000	Nominal Change	Percent Change	Percent Change Per Year
Ministry of Finance	£214	£727	£513	240.2%	19.2%
Operating subsidy	£35	£499			
SHIP premiums	£179	£228			
Households	£395	£503	£108	27.3%	5.0%
Law 32	£18	£30			
Law 79	£49	£80			
SHIP Premiums	£60	£76			
Widows & pensioners	£19	£20			
Cigarette taxes	£219	£242			
Co-payments at POS	£30	£55			
Employers	£322	£520	£198	61.4%	10.1%
Law 32	£55	£89			
Law 79	£148	£239			
Labor accident	£108	£174			
Companies with waivers	£11	£18			
Donors	£12	£15	£3	27.6%	5.0%
Total	£943	£1,765	£822	87.2%	13.4%

Note: Data in this table are model output based on HIO cash outlay/revenue figures for FY 1995, except for SHIP premiums, which are on an accrued basis (cash revenue figures for FY 1995 show government contributions at 67% of what is owed, and household contributions at 107% of what was owed). Since the MOF must cover the operating deficits (in addition to contributing SHIP premiums), the SHIP premiums are shown as what is actually owed, and the "operating subsidy" is the remainder required.

Table 5.4C: HIO Program Expenditures by Provider, 1995 and 2000 (in millions, outlays)

Provider	1995	2000	Nominal Change	Percent Change	Percent Change per Year
MOH	£17	£25	£8	46.9%	8.0%
HIO	£530	£979	£449	84.8%	13.1%
Other public	£67	£118	£51	76.2%	12.0%
Private hospitals	£71	£125	£54	76.2%	12.0%
Pharmacies	£237	£481	£244	102.8%	15.2%
Other	£21	£37	£16	76.2%	12.0%
Total	£943	£1,765	£822	87.2%	13.4%

Source: Table 5.3C

Table 5.4D: HIO Revenues, by Source, and Total Expenditures, 1995 and 2000 (in millions, accrual basis)

Source	1995	2000	Nominal Change	Percent Change	Percent Change Per Year
Govt. Deficit Financing	£35	£499	£464	1326%	68%
Other Revenue	£908	£1,266	£358	39%	7%
Total Revenue/Expenditures	£943	£1,765	£822	87%	13%

Source: Data for 1995 from 1995 HIO Annual Report, as reported in 1997 NHA Report, pp. 27-39. Data for 2000 are projections of the model, based on 1995 data and parametric assumptions.

Table 5.4E: HIO Revenues by Source, 1995 and 2000 (in millions, accrual basis)

Source of Revenue	1995	2000	Nominal Change	Percent Change	Percent Change Per Year
Ministry of Finance	£248	£733	£484	194.9%	21.7%
Operating Subsidy	£70	£505			
SHIP Premiums	£179	£228			
Households	£395	£505	£110	27.8%	5.0%
Law 32	£18	£30			
Law 79	£49	£80			
SHIP Premiums	£60	£76			
Widows & pensioners	£19	£20			
Cigarette taxes	£219	£242			
Co-payments at POS	£30	£57			
Employers	£322	£520	£198	61.4%	10.7%
Law 32	£55	£89			
Law 79	£148	£239			
Labor accident	£108	£174			
Companies with waivers	£11	£18			
Donors	£12	£15	£3	27.6%	5.0%
Budget outlay lag	-$34	-£26			
Total	£943	£1,747	£803	85.2%	13.1%

This is a compilation from the data on page 35 of the 1997 NHA Report. The numbers for households and employers are s lightly lower than in the model output from Baseline 2

It is clear from the HIO program deficit projected for 2000, as shown in Table 5.4, that some adjustment may need to be made to the way SHIP is financed. The source of the growing gap is the naturally growing difference between: (1) receipts of fixed premiums (LE 4 per year per student from the family and LE 12 per year per student from the government) and (2) unconstrained costs of providing the promised services (projected to grow at 13 percent annually). Such costs grow according to utilization and costs of services (per student). This 13 percent yearly overall spending growth rate is due to a combination of 6 percent yearly growth in average costs,[34] a 2.5 percent yearly growth in utilization per enrollee, and a 4 percent yearly growth in enrollment. Unless premiums are

[34] This 6 percent rate is lower than one might expect (from the 8 percent assumed for services, and 12 percent assumed for drugs) because most of the growth in HIO enrollment is in SHIP enrollment where costs per enrollee are much lower than average.

somehow made to grow more or less at the same rate as with income growth (which may or may not keep up with the growth in prices and use of services[35]), the real value of the fixed premium will progressively decline, and the program's deficit will be certain to grow substantially over the years. In the absence of any change in the premium, the difference between spending and revenue will continue to grow. If it continues to grow at the same rate during the 2000-2005 period, the required HIO operating subsidy (to eliminate the deficit) from the MOF would be approaching LE 1.5 billion by 2005.

This estimate of a projected HIO deficit is, of course, not very realistic. It is unlikely that the Government of Egypt would allow a deficit of this size, or, for that matter, finance it with public funds. What this projection highlights is that with fixed premium rates and revenue, rising employment and costs, and an expansive benefit package, resources are not in balance with fulfilling the full commitment of HIO to SHIP. This is not an unusual situation for social health insurance in a developing country. In practice, something has to give. Usually, it is service access and quality, with the result that the beneficiary population makes fewer demands for insured services. The model points out this imbalance. Different scenarios can be estimated that are designed to close this gap.

One policy scenario is developed and estimated to determine the impact of raising the SHIP premiums, effective for the year 2000, on the year 2000 HIO deficit. If the gap were to be closed by asking SHIP users to pay more for services through higher premiums, the fixed premium would have to be raised. Raising it substantially, of course, to eliminate the entire gap in 2000 would be a hardship for those at the lowest income levels. The model can help determine how much the government would have to pay to cover the remaining gap if the per student premium were raised, say, to LE 5, LE 6, or LE 7 per year.

To address this policy area, the model is asked to answer two questions focusing on estimating the impact of raising SHIP premiums[36].

- What would be the impact on the HIO deficit of raising SHIP premiums from the current level of LE 16, with the same 75 percent proportion of that still covered by the government (e.g., parents paying LE 5, LE 6, or LE 7 per child instead of LE 4)?

- What would the premium then have to rise each year, under the model's current assumptions, in order to keep SHIP revenues cover a constant proportion of SHIP program costs (after SHIP premiums are raised)?

The estimates made for answering these two questions derive from a scenario, called "raise SHIP premium." The estimates resulting from this scenario derive from increasing the government premium as indicated, and from reducing the utilization assumptions. The utilization reduction is needed to reflect the fact that higher premiums would reduce enrollment, which would, in turn, reduce use. The impacts of both changes for the government of these model assumptions are expected to be in the same direction of reducing the HIO operating deficit. Needless to say, the impacts on HIO enrollees would be to increase their premiums and out-of-pocket costs and to decrease their access to services, with these effects disproportionately hurting the lower income groups.

[35] This model assumes per capita income growth and growth in the unit cost of medical services (excluding drugs) are both 8 percent.

[36] The model could be used to reveal the distributional impact of the premium changes, but using current assumptions would merely be illustrative, and not particularly revealing of any potential reality. Once the assumptions are validated by more recent data, it would be useful to examine the distributional impact of any proposed policy changes.

5.2.1.2 Combating Infant and Maternal Mortality: Improving Prenatal Care

Both infant and maternal mortality rates are high in Egypt and reductions in these rates have been identified as priorities for the health sector. In addition, there are significant differences in both sets of mortality rates between urban and rural area and between governorates.

In light of this health priority, one option for modeling a health policy scenario of interest to the Egyptian government is to allow for the introduction of a national infant and maternal mortality reduction program into the Egyptian health system. Under this scenario, prenatal checkups would be provided through the national program. The modeling of the "prenatal care" scenario will enable the user to vary the number of checkups to be provided. The model will then cost the different programs and examine the resource implications of the alternative programs.

There is future potential for the model to be extended to include a health outcomes module, which would facilitate comparisons of the impact of providing different levels of services on infant and maternal mortality, as compared the costs of different policy options.

5.2.2 Scenario Assumptions and Estimation

5.2.2.1 Scenario 1: HIO Financing "Raise SHIP Premium"

Table 5.5 shows the assumptions and the results of the scenario "raise SHIP premium." The key assumptions are:

1. Raising the SHIP premium would have the effect of reducing voluntary enrollment. Table 5.5B shows the impacts on revenues, expenditures, and the HIO program deficit of the three premiums modeled. Assuming a price elasticity of demand for health insurance of -0.4, as Table 5.5A shows, a 25 percent increase in the premium would decrease enrollment by 10 percent, and higher premiums would decrease enrollment proportionately. Decreased enrollment would have the effects of reducing co-payment revenue and overall expenditures. In addition, a 25 percent increase in the premium to LE 5 would mean a net increase in premium revenue of LE 36.9 million and would be supplemented by a decrease in total expenditures of LE 104 million. This would mean the deficit would be reduced by LE 142 million. The model also projects that the reduction in the deficit for a family premium of LE 6 and LE 7 per students is estimated to be LE 270 million and LE 383 million, respectively.

2. While 1993 premiums for SHIP enrollees were initially set at levels which exceeded the costs of serving them, the surplus has long since turned to a deficit—albeit one that is not yet worse than the operating deficit for non-SHIP HIO enrollees. The non-SHIP premiums, however, at least rise with nominal wage income because the rates are set as a percentage of wages. SHIP premiums are fixed, and therefore contribute an ever smaller proportion of the costs of providing services to SHIP enrollees (which grow with utilization and price inflation).

The data presented in Table 5.5 focus on the changes only for HIO enrollment, revenues, and expenditures. Clearly, the model can generate results for all other dimensions of the NHA tables, once the analyst has made appropriate adjustments in enrollment in other health plans and choices among provider types—to reflect the change in relative prices of plan enrollment and provider choices.

While these are not presented here, it should be kept in mind that the model has the capability to produce a variety of results which would reflect the indirect and interactive effects of the HIO premium change on other parts of the Egyptian health sector.

Table 5.5A: Assumptions for Scenario "Raise SHIP Premium" for the Year 2000

Household premium	£4	£5	£6	£7
Premium change		25%	50%	75%
Enrollment change, percentage		-10%	-20%	-30%
Enrollment change, number		1.8	3.7	5.5
SHIP Enrollment*				
Before change	19.0	19.0	19.0	19.0
After change	19.0	17.2	15.3	13.5
Utilization change, all HIO	0.0%	5.9%	11.8%	17.7%
Co-payment revenues				
Before change	£16.4	£16.4	£16.4	£16.4
After change	£16.4	£15.5	£14.5	£13.5
Difference	£0.0	-£1.0	-£1.9	-£2.9
Premium revenues, from households				
Before change	£76.0	£95.0	£114.0	£133.0
After change	£76.0	£85.8	£91.9	£94.3
Difference	£0.0	-£9.2	-£22.1	-£38.7
Premium revenues, from government				
Before change	£228.0	£285.1	£342.1	£399.1
After change	£228.0	£257.4	£275.7	£282.9
Difference	£0.0	-£27.7	-£66.4	-£116.2
Total SHIP premium revenue (reflecting enrollment changes)				
Before change	£304.1	£380.1	£456.1	£532.1
After change	£304.1	£343.2	£367.6	£377.2
Difference	£0.0	-£36.9	-£88.5	-£154.9
Expenditures (reflecting utilization changes)				
Before change	£1,765	£1,765	£1,765	£1,765
After change	£1,765	£1,661	£1,557	£1,453
Difference	£0	-£104	-£208	-£312

Notes:
* This implies an arc price elasticity of -0.4.
"Before change" = Baseline B
"After change" = "Raise SHIP premium" scenario

Table 5.5B: Results for Scenario "Raise SHIP Premium" for the Year 2000

Household premium	£4	£5	£6	£7
Revenues (except government operational subsidy)				
Donors	£15.2	£15.2	£15.2	£15.2
NonSHIP Premiums				
Employers	£519.8	£519.8	£519.8	£519.8
Employees	£109.2	£109.2	£109.2	£109.2
Widows & pensioners	£20.4	£20.4	£20.4	£20.4
SHIP Premiums				
From households	£76.0	£85.8	£91.9	£94.3
From government*	£228.0	£257.4	£275.7	£282.9
Cigarette taxes	£255.3	£255.3	£255.3	£255.3
Co-payments	£16.4	£15.5	£14.5	£13.5
Total				
NonSHIP	£664.6	£664.6	£664.6	£664.6
SHIP	£559.4	£598.5	£622.9	£632.5
Total	£1,224.0	£1,263.1	£1,287.5	£1,297.1
SHIP Co-payments	£16.4	£15.5	£14.5	£13.5
Other revenue	£25.6	£25.6	£25.6	£25.6
Operational subsidy	£499.0	£356.7	£229.1	£116.4
Total Revenue	£1,765	£1,661	£1,557	£1,453
Total Expenditures	£1,765	£1,661	£1,557	£1,453
NonSHIP	£1,077	£1,077	£1,077	£1,077
SHIP	£688	£584	£480	£376
Overall (Deficit)/Surplus**	-£499	-£357	-£229	-£116
NonSHIP	-£386	-£386	-£386	-£386
SHIP	-£113	£30	£157	£270
Change in Deficit	£0.0	-£142	-£270	-£383
For each level of SHIP family premium, the following is the implicit gov. premium per student:				
Household premium per student	£4	£5	£6	£7
Government premium per student	£12	£15	£18	£21
Total government subsidy	£499	£357	£229	£116
Additional cost per student	£6	-£2	-£8	-£14
Total gov. cost per student	£18	£13	£10	£7
Gov. cost as % of total cost	82%	73%	62%	49%

Notes:
* Assuming government contributes three times the household premium.
** The government's operational subsidy (not including the SHIP premium amount).

5.2.2.2 Scenario 2: MOH Program "Prenatal Care Scenario"

The policy analyst must model a number of elements, and make a number of assumptions about the health sector. The following parameters and/or assumptions have been made in the prenatal care scenario:

1. **Regional and income-specific fertility rates**: The levels of infant and maternal mortality are related to the fertility rate of each region and are probably dependent on the income and education of women. To reflect this, the model has been designed to allow the policy analyst to specify fertility rates for 19-49 year old females for each of the five income quintiles and three regions (rural, urban, and governorate), regardless of their insurance status. The fertility rate assumption tries to distribute total births in Egypt by region. The assigned weights allow policy analysts to factor in higher rates of fertility in rural areas as compared to lower rates of fertility in metropolitan areas, despite the lack of data on this area. The model also allows for different fertility rates to be specified for females with different income levels, where this information is known or can reasonably be estimated. As shown in Table 5.6, fertility rate assumptions for this scenario vary only by region; in governorates, fertility is 4.2 percent; in other urban areas, 8.45 percent; and in rural areas, 16.9 percent.

2. **Fertility rate of decline** : There often exist trends in fertility rates that are not directly related to a specific policy. The model allows for a single parameter to be specified as the rate of change in fertility in Egypt over time, which is then applied to all regions of Egypt. This parameter is assumed in this scenario. If rate of decline information is not available, but total number of projected births are, the assumption allows the policy analyst to calculate total births in the country for each year or determine the changes of fertility over time.

3. **Prenatal number of entitled medical contacts per pregnant woman**: The number of medical contacts per pregnant woman is the principal policy variable in this scenario and it is defined by a single parameter, the value of which is two (contacts). This assumption enables the analyst to specify how many times a woman would be entitled to visit a medical professional in a year during her pregnancy, over and above the existing number of prenatal medical contacts which have been occurring before the program came into effect. Setting this parameter to zero would automatically indicate the status quo—the Egypt Health Expenditure and Utilization Survey estimate of medical contacts in 1995 and the growth rate of general medical contacts including prenatal care. As a separate value can be assigned for each year, the policy analyst can decide which year this policy can be introduced. It is assumed that women accessing these prenatal care services will be provided with drugs and dressings at the same rate (relative to numbers of visits) as is currently being provided through primary care facilities.

4. **Prenatal service take-up rates**: This is a behavioral assumption defined by each region and income quintile as an array of fifteen values (the average of which is shown in Table 5.6). If all values in this array were set to equal one, the model would make service demand equal to service use. The policy analyst can vary the weights in this array to modify the distribution of these services in each region based on a judgement of how different populations behave.

5. **Method of service delivery and administration**: It is assumed that the MOH will commission this policy and that the MOH Rural Health Units and Maternal and Child

Health Centers will provide the services. Based on this arrangement, projected antenatal medical service use is simply added to the MOH medical contacts in health units and MCH centers projected for the base scenario. Using this method, the model automatically picks up input/output, efficiency, and resource cost assumptions for MOH health units, which remain unchanged. Variations on this assumption could examine the impact of improved efficiency in production of service, as well as expansion in the number of services actually delivered.

6. **Modeled elements**: Projected births are calculated by multiplying regional age-specific fertility rates (weights) by the estimated number of women in the age group 19-49 in a particular year. Projected prenatal care medical contact rates (entitlement) is calculated by multiplying entitlement in a year by the take-up rates. Projected prenatal care medical service use is calculated by multiplying projected prenatal medical contact rates by number of projected births.

Table 5.6 summarizes the assumptions and results of the estimation of the prenatal care scenario. It shows that the guaranteed provision of at least two prenatal visits to pregnant women results in LE 22 million in additional costs to the MOH in 2000 and LE 3 million in additional out-of-pocket expenses by patients. Since these additional costs provide an additional 2.4 million visits to mothers, the average cost of the additional visits is estimated to be about LE 9 for the MOH and about LE 1 for the patients. While seemingly high, these costs would be rather modest in comparison to the benefits likely to be realized from healthier babies at delivery. This model estimating costs could be supplemented by a Health Outcomes model to compare costs with potential benefits. However, this is beyond the scope of this current activity.

Table 5.6A: Assumptions for Scenario "Prenatal Care Program" for the Year 2000

	1995	2000
Women 19-50	12.3	13.4
Fertility rates		
Governorates	4.22%	4.22%
Urban areas	8.45%	8.45%
Rural areas	16.90%	16.90%
Pregnant Women	1.37	1.49
Governorates	0.11	0.13
Urban areas	0.37	0.40
Rural areas	0.89	0.97
Antenatal visit entitlement	NA	2.0
Antenatal visit take-up rate, avg.	NA	0.6
Total PHC visits by target group		
Before program	9.0	10.0
After program	NA	12.4

Table 5.6B: Results of Scenario "Prenatal Care Program" for the Year 2000 (in millions)

	1995	2000
MOH Public Health Expenditures*†		
Before program	£1,340	£2,142
After program		£2,164
Change		£22
Cost per visit		£9.18
Household OOP Spending†		
Before program	£3,780	£7,119
After program		£7,122
Change		£3
Cost per visit		£1.37

Notes:
*. Assumes that services needed and demanded are fully funded by MOH.
† Assumes that marginal cost is one-fourth of average cost.

6. Findings and Recommendations

6.1 Findings

> This experiment to try to integrate health financial reform modeling with development of NHA has proven a positive one, both as a specific application to Egypt (with *EgyptPro*) as well as a general foundation for similar efforts in other countries.

> *EgyptPro* is a significant step forward in developing tools for the creation and use of NHA to assist in the process of analyzing alternative health programs and policies in developing countries—particularly policies which reform the financing of health care.

> *EgyptPro* is a large model, and can be very slow in the operation of some of its functions if file size is not well-managed. This slowness can increase as scenarios are saved, and the size of the files increases. Its evolved size can be reduced with prudent management of space. The model, therefore, is an excellent first step, which could benefit the NHA efforts of the Egyptians and could provide the basis for model development in other countries that implement NHA.

> Since the model uses a relatively fixed-relationships[37] approach to projecting future values, the burden is on the analyst to ensure that parameters entered into the model and assumptions made about market and institutional behavior are well-founded, both in theory and in empirical fact. The analyst, in any event, should hesitate to put great confidence in the accuracy of any particular projection of future impacts estimated for any scenario. However, in adopting an appropriately realistic perspective on the limits of using the model, the analyst can profitably apply the model for many policy analytic exercises and for educating policymakers about the quantifiable dimensions of the interactions of various alternative policies and programs.

> The burden on the analyst is particularly heavy with respect to ensuring consistency of assumptions about changes in enrollment in major insurance programs and selection of provider type. At present, the revenue implications of such assumptions must be entered separately from the expenditure implications. *EgyptPro* now has a considerable learning curve for the analyst seeking to become skilled in understanding and using it. However, Version 1.1 is a substantial improvement over Version 1.0.

> The model offers benefits specific to the goals and interests of USAID. Its comprehensive framework enables policymakers to consider impacts of reform policies on both public and private sectors (and their interactions), and its disaggregated database provides a foundation for examining program and policy impacts by region, sex, income, and insurance status. It would be of particular help in analyzing the requirements and impacts of policies aimed at improving the sustainability of preventive and public health programs.

[37] That is, the relationships in the model are all known relationships. Unknown relationships that are traditionally part of simulation models are not included and must be defined by the analyst. The model was defined in this way to maximize flexibility.

> The exercise also highlighted the need to consider the data requirements for both developing National Health Accounts and policy modeling, during data collection phase within a country. In the case of Egypt, data collection was undertaken with only the development of the national Health Accounts in mind. This created difficulties in providing an adequate database with which to undertake policy modeling.

6.2 Recommendations

> After considering how to modify the most difficult aspects of the current model, PHR should make an effort to convince other professionals and policymakers involved in health financing and NHA in developing countries of the value of this integrated model,

> PHR should endorse the development and use of such models in support of the policy-relevant use of NHA in the countries currently involved in the first round of estimates.

> PHR should develop a standard, as much as is feasible, for the integrated model's components, approaches, and parameters (i.e., to identify the boundaries for its size and complexity in country-specific applications) in order to facilitate its development in other countries.

Annex A. Parametric Assumptions: Basis for Estimates

Estimates of projected levels of revenue and spending in the health sector depend upon estimates of a number of key parameters. The most important of these parameters are population, income, and prices—and their growth rates over time. In fact, any projection is essentially a composite of a variety of growth rates applied to base year amounts for important variables. Therefore, given the base year amounts entered in the model, the end results of a projection will basically reflect the various growth rate assumptions and the interactions among those variables.

The method for estimating growth rates of key variables used in the model is to determine recent trends in their growth and to trend those growth rates forward, taking into account any factors which would have predictable impacts on the growth rates. Estimates of recent trends in Egypt were obtained from the 1998 World Development Indicators published by the World Bank. The relevant variables are noted in Table A.

Table A1: Key Economic Indicators, Egypt 1993-1996

Indicator	Year				Yearly Avg. 1993-1996
	1993	1994	1995	1996	
Population (millions)	55.93	57.064	58.18	59.272	
		2.0%	2.0%	1.9%	2.0%
GDP (mkt. prices) (billions)	£157.3	£175.0	£200.4	£229.5	
(current prices)		11.3%	14.5%	14.5%	13.4%
Nominal GDP/capita	£2,812	£3,067	£3,445	£3,871	
		9.1%	12.3%	12.4%	11.3%
GDP (mkt. prices) (billions)	£65.2	£67.7	£70.8	£74.3	
(1987 prices)		3.9%	4.6%	5.0%	4.5%
Real GDP/capita	£1,165	£1,186	£1,217	£1,254	
		1.8%	2.6%	3.0%	2.5%
GDP deflator (index)	241.32	258.58	283.08	308.78	
		7.2%	9.5%	9.1%	8.5%
Consumer prices (index)	254.10	274.82	318.08	340.94	
		8.2%	15.7%	7.2%	10.3%

Source: The World Bank, 1998.

Based on the data shown in Table A, the following assumptions were made:

Variables	Yearly Growth, During 1995-2000
Medical care input prices (except drugs)	8%
Medical care services prices	8%
Drug prices	12%
Salaries, medical staff	8%
Income (wages) per capita	8%
Population	1.9%

These estimates are based on trends during 1993 through 1996—just one year into the projection period. The income growth assumption is lower than recent trends, assuming as it does constant real per capita income; this reflects an assumption that real per capita income would not grow, and would not decline. The drug price growth was estimated based on the reasonable assumption that growth would be 50 percent higher than growth in general medical care prices, due to the high foreign exchange component and higher price growth historically experienced in the drug sector. These estimated growth rates do not constitute the basis for a "forecast," but merely a projection of recent trends. One beneficial feature of the model is that one can test the sensitivity of its projections to variations in particular growth rate assumptions.

Annex B. Growth in Medical Care Use and its Distribution by Provider: Basis for Estimates

If the analyst does not enter assumed growth rates for medical care use and for its distribution by provider, the model will generate projections which assume no changes from the data entered for the 1995 base year (i.e., growth rates have been initially entered at zero). In fact, it is reasonable, based on past experience, to assume that total medical care use (outpatient and inpatient) and its distribution will change because of three major factors: population growth, rate of use per person, and rate of use per person by provider.

Rate of use per person has been entered into the model for disaggregated demographic cohorts (identified by age, sex, income, region, and insurance status). Any changes in these rates could conceivably be entered to be specific to the cohorts which have unique rates assigned to them. Table B1 shows an example of the differences in rates of use, and in their distribution among providers, across income quintiles. In using the model, however, growth rate assumptions have been entered for the population as a whole. Hospital admissions are assumed to grow at 0.5 percent per year, and ambulatory care visits are assumed to grow at 1.0 percent per year, more or less in line with historical rates of growth.

Distribution of hospital admissions and outpatient visits according to provider type, however, is entered into the model in terms of percentage share of the market. Therefore, the determination of growth rates must be normalized so that the sum of shares of all providers (by inpatient and by outpatient) actually equals one. The method for approaching the estimates was to view two major secular trends as driving the distribution among providers. First, there has been relatively higher growth in the private sector, averaging 5 percent per year between NHA estimate for 1991 and for 1995, (although it seems that the 1991 NHA estimates was too low for the private sector). Second, there has been a 5 percent annual growth in the number of students enrolled in the SHIP program.

As Table 5.5 demonstrated, the proportion for HIO enrollment which comprises SHIP enrollees is expected to rise from 72 percent in 1995 to 75 percent in 2000. The projection of a 5 percent annual growth in SHIP enrollment is reasonable in view of the fact that the LE 4 per student premium required for enrollment is fixed, while medical care prices are expected to rise. This means that the relative price of coverage is constantly declining in real terms, making enrollment an attractive alternative to paying out-of-pocket when sick.

Table B1: Share of Medical Utilization by Provider, by Income Quintile, Egypt, 1995

Provider Group	Income Quintile (poorest to richest)					Total
	1	2	3	4	5	
Inpatient Admissions						
Ministry of Health	44%	35%	32%	33%	22%	33%
HIO	10%	17%	15%	18%	14%	15%
CCO	5%	0%	6%	1%	2%	3%
Private	0%	4%	8%	12%	34%	11%
Other	41%	44%	39%	36%	28%	38%
Total	100%	100%	100%	100%	100%	100%
Outpatient Visits						
MOH hospitals	27%	17%	9%	8%	4%	13%
MOH health units	8%	8%	8%	5%	2%	6%
Teaching hospitals	10%	10%	2%	4%	2%	6%
HIO clinics	12%	11%	9%	7%	9%	9%
Other gov. clinics	3%	11%	11%	17%	12%	11%
Private clinics	25%	20%	37%	38%	51%	34%
Pharmacies	5%	2%	4%	3%	1%	3%
Mosques	9%	21%	20%	17%	17%	17%
Other	1%	0%	0%	1%	2%	1%
Total	100%	100%	100%	100%	100%	100%

Source: *EgyptPro* Base_1995 scenario output

HIO data show that SHIP enrollees experience average costs which are 27 percent of the average cost of providing benefits to government workers (covered under Law 32). Using this relative average cost (together with relative cost data for all 79 enrollees and for pensioners and widows), the 5 percent annual growth in SHIP enrollment and 1.9 percent annual growth in non-SHIP enrollment would translate into utilization growth (weighted by the relative average costs) of about 3.1 percent per year, or about 1.2 percent per enrollee. This calculation is shown in Tables B2, B3 and B4. Since growth in the private sector has exceeded growth in all other provider groups in recent years, it is reasonable to assume that some of the growth in HIO use will be provided through contracts with private providers. It is assumed that private sector utilization will grow at the rate of 2.25 percent per year. Since HIO enrollees split their use rather evenly between HIO facilities and contracted private clinics and hospitals, the HIO utilization growth rate is assumed to be the weighted average of the estimated growth in HIO facilities (1.2 percent) and in the private sector (2.3 percent). Thus the HIO growth rate is assumed to be 1.75 percent yearly overall. Yearly use growth for all other providers was assumed to be reduced proportionally, after assuming that yearly growth for CCO would be 0 percent.

Table B5 shows the calculation of growth rates to be applied to each provider group for every year during the period 1995-2000. It also shows how the efficiency factors are derived to adjust total costs for the fact that they are calculated based on average costs when they should be calculated based on marginal costs. It is assumed that marginal costs are 50 percent of average costs in inpatient settings, and that they are 25 percent of average costs in outpatient settings.

Table B6 provides a listing of all the parametric assumptions made in Scenarios Baseline A, Baseline B, and Prenatal Care.

Table B2: Calculation of Projected Total Utilization Growth, HIO, Egypt, 1995-2000

	Enrollment in HIO					
HIO Enrollee Group	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Pensioners etc	697,000	710,243	723,738	737,489	751,501	765,779
Law 79	2,372,000	2,417,068	2,462,992	2,509,789	2,557,475	2,606,067
Law 32	2,782,000	2,834,858	2,888,720	2,943,606	2,999,535	3,056,526
SHIP	14,890,165	15,634,673	16,416,407	17,237,227	18,099,089	19,004,043
Total	20,741,165	21,596,842	22,491,857	23,428,111	24,407,599	25,432,415

Table B3: Total Utilization by HIO Groups Weighted by Relative Use

	Relative Cost Wts.	**Weighted Utilization Indexes by Year**					
		1995	**1996**	**1997**	**1998**	**1999**	**2000**
Pensioners etc.	2.21	1,541,821	1,571,116	1,600,967	1,631,386	1,662,382	1,693,967
Law 79	1.29	3,064,087	3,122,305	3,181,629	3,242,080	3,303,679	3,366,449
Law 32	1.00	2,782,000	2,834,858	2,888,720	2,943,606	2,999,535	3,056,526
SHIP	0.27	4,076,613	4,280,444	4,494,466	4,719,189	4,955,149	5,202,906
Total		11,464,522	11,808,723	12,165,782	12,536,261	12,920,745	13,319,848
Growth incl. pop growth			3.00%	3.02%	3.05%	3.07%	3.09%
Growth excl pop growth			1.08%	1.10%	1.12%	1.15%	1.17%
SHIP as % of enrollment							61%
SHIP as % of costs							39%

Notes:
Average costs of enrollee groups in relation to average costs of Law 32 workers.
Enrollment by year weighted by relative cost weights; total use growth is yearly growth in the sum of weighted use.

Table B4: Growth in Proportion of Costs

	1995	**1996**	**1997**	**1998**	**1999**	**2000**
Pensioners etc	13%	13%	13%	13%	13%	13%
Older employees	27%	26%	26%	26%	26%	25%
Regular employees	24%	24%	24%	23%	23%	23%
SHIP	36%	36%	37%	38%	38%	39%
Total	100%	100%	100%	100%	100%	100%
Growth						
Pensioners etc.		-1.07%	-1.09%	-1.11%	-1.13%	-1.15%
Older employees		-1.07%	-1.09%	-1.11%	-1.13%	-1.15%
Regular employees		-1.07%	-1.09%	-1.11%	-1.13%	-1.15%
SHIP		1.94%	1.92%	1.90%	1.88%	1.85%
Total		0.00%	0.00%	0.00%	0.00%	0.00%

Table B5: Calculation of Projected Provider Share Growth, Egypt, 1995 - 2000

	Calculation of Provider Share Growth						Calculation of Efficiency Factors/4				
	1995 Shares	Imputed Growth, Yearly, 1995-2000	Imputed 2000 Shares/1 (Normalized)	Imputed 2000 Shares (Index)/2	Percent Change Absolute (Index)	Yearly Change in Use Absolute (Index)/3	MC as % of AC	Decay Exponent/5	Implied "Efficiency"	Normalized	Share % Change
Inpatient											
MOH	33%	-0.759%	31.8%	0.36	8.4%	1.6%	50%	-0.802%	99.198%	0.317666	-3.7%
HIO	15%	1.750%	16.4%	0.18	22.8%	4.2%	50%	-2.015%	97.985%	0.163593	9.1%
CCO	3%	0.000%	3.0%	0.03	12.6%	2.4%	50%	-1.177%	98.823%	0.03	0.0%
Private	11%	2.250%	12.3%	0.14	25.9%	4.7%	50%	-2.249%	97.751%	0.122945	11.8%
Other	38%	-0.759%	36.6%	0.41	8.4%	1.6%	50%	-0.802%	99.198%	0.365797	-3.7%
	100%		100%	1.13	12.6%	2.4%				1	
Outpatient											
MOH	13%	-1.000%	12.4%	0.14	9.8%	1.9%	25%	-1.391%	98.609%	0.123321	-5.1%
MOHHU	6%	-1.000%	5.7%	0.07	9.8%	1.9%	25%	-1.391%	98.609%	0.056918	-5.1%
Teaching	6%	-2.170%	5.4%	0.06	3.5%	0.7%	25%	-0.514%	99.486%	0.053633	-10.6%
HIO	9%	1.750%	9.8%	0.11	25.9%	4.7%	25%	-3.380%	96.620%	0.097912	8.8%
Other gov.	11%	-2.170%	9.9%	0.11	3.5%	0.7%	25%	-0.514%	99.486%	0.098327	-10.6%
Private	34%	2.250%	38.0%	0.44	29.1%	5.2%	33%	-3.336%	96.664%	0.379066	11.5%
Pharmacies	3%	0.000%	3.0%	0.03	15.5%	2.9%	25%	-2.128%	97.872%	0.029925	-0.2%
Mosques	17%	-2.170%	15.2%	0.18	3.5%	0.7%	25%	-0.514%	99.486%	0.15196	-10.6%
Other gov.	1%	-2.170%	0.9%	0.01	3.5%	0.7%	25%	-0.514%	99.486%	0.008939	-10.6%
	100%		100%	1.16	15.8%	3.0%				1	

Table B6: Growth Rates of Parametric Assumptions, EgyptPro, 1995-2000

	Annual Growth Rates Through 2000		
	Scenarios		Prenatal Care
	Baseline A	Baseline B	
Population growth	1.90%	1.90%	1.90%
Utilization growth, hospital	0.50%	0.50%	0.50%
Utilization growth, medical	1.00%	1.00%	1.00%
Hospital distribution growth			
MOH	0.00%	-0.759%	-0.759%
HIO	0.00%	1.750%	1.750%
CCO	0.00%	0.000%	0.000%
Private	0.00%	2.250%	2.250%
Other	0.00%	-0.759%	-0.759%
Outpatient distribution growth			
MOH outpatient	0.00%	-1.000%	-1.000%
MOHHU	0.00%	-1.000%	-1.000%
Teaching	0.00%	-2.170%	-2.170%
HIO	0.00%	1.750%	1.750%
Other gov.	0.00%	-2.170%	-2.170%
Private	0.00%	2.250%	2.250%
Pharmacy	0.00%	0.000%	0.000%
Mosque	0.00%	-2.170%	-2.170%
Other	0.00%	-2.170%	-2.170%
MOH hospital outpatient			
Efficiency MD	0.00%	-0.802%	-0.802%
Nurse	0.00%	-1.706%	-1.706%
Other	0.00%	-1.706%	-1.706%
Salary growth MD	8.00%	8.00%	8.00%
Nurse	8.00%	8.00%	8.00%
Other	8.00%	8.00%	8.00%
Drug cost growth	8.00%	8.00%	8.00%
Med. supplies cost growth	8.00%	8.00%	8.00%
Other supplies cost growth	8.00%	8.00%	8.00%
OOP cost, drugs/contact			
OOP cost, total/contact			
MOHHU			
OOP cost, drugs/contact			
OOP cost, total/contact			
HIO			
OOP cost, drugs/contact	10.00%	10.00%	10.00%

		Annual Growth Rates Through 2000		
		Scenarios		Prenatal Care
		Baseline A	Baseline B	
OOP cost, total/contact		5.20%	5.20%	5.20%
Private				
OOP cost, drugs/contact		12.00%	12.00%	12.00%
OOP cost, total/contact		10.34%	10.34%	10.34%
Pharmacy				
OOP cost, drugs/contact		12.00%	12.00%	12.00%
OOP cost, total/contact		11.46%	11.46%	11.46%
TH				
OOP cost, drugs/contact				
OOP cost, total/contact				
Other govt.				
OOP cost, drugs/contact				
OOP cost, total/contact				
Mosque				
OOP cost, drugs/contact		12.00%	12.00%	12.00%
OOP cost, total/contact		9.48%	9.48%	9.48%
All other				
OOP cost, drugs/contact				
OOP cost, total/contact				
ALOS growth				
MOH				
HIO				
CCO				
Other				
Labor efficiency, hospitals				
MOH	MD	0.00%	-0.80200%	-0.80200%
	Nurse	0.00%	-0.80200%	-0.80200%
	Other	0.00%	-0.80200%	-0.80200%
HIO	MD	0.00%	-2.01500%	-2.01500%
	Nurse	0.00%	-2.01500%	-2.01500%
	Other	0.00%	-2.01500%	-2.01500%
CCO	MD	0.00%	-1.17700%	-1.17700%
	Nurse	0.00%	-1.17700%	-1.17700%
	Other	0.00%	-1.17700%	-1.17700%
Private	MD	0.00%	-2.24900%	-2.24900%
	Nurse	0.00%	-2.24900%	-2.24900%
	Other	0.00%	-2.24900%	-2.24900%

		Annual Growth Rates Through 2000		
		Scenarios		Prenatal Care
		Baseline A	Baseline B	
Other	MOD	0.00%	-0.80200%	-0.80200%
	Nurse	0.00%	-0.80200%	-0.80200%
	Other	0.00%	-0.80200%	-0.80200%
Salary growth, hospitals				
MOH	MD	8.00%	8.00%	8.00%
	Nurse	8.00%	8.00%	8.00%
	Other	8.00%	8.00%	8.00%
HIO	MD	8.00%	8.00%	8.00%
	Nurse	8.00%	8.00%	8.00%
	Other	8.00%	8.00%	8.00%
CCO	MOD	8.00%	8.00%	8.00%
	Nurse	8.00%	8.00%	8.00%
	Other	8.00%	8.00%	8.00%
Private	MD	8.00%	8.00%	8.00%
	Nurse	8.00%	8.00%	8.00%
	Other	8.00%	8.00%	8.00%
Other	MD	8.00%	8.00%	8.00%
	Nurse	8.00%	8.00%	8.00%
	Other	8.00%	8.00%	8.00%
MOH hospitals				
Drug cost growth		8.00%	8.00%	8.00%
Food cost growth		8.00%	8.00%	8.00%
Med. supplies cost growth		8.00%	8.00%	8.00%
Other supplies cost growth		8.00%	8.00%	8.00%
HIO hospitals				
Drug cost growth		10.00%	10.00%	10.00%
Food cost growth		8.00%	8.00%	8.00%
Med. supplies cost growth		8.00%	8.00%	8.00%
Other supplies cost growth		8.00%	8.00%	8.00%
CCO hospitals				
Drug cost growth		12.00%	12.00%	12.00%
Food cost growth		8.00%	8.00%	8.00%
Med. supplies cost growth		8.00%	8.00%	8.00%
Other supplies cost growth		8.00%	8.00%	8.00%
Private hospitals				
Drug cost growth		12.00%	12.00%	12.00%
Food cost growth		8.00%	8.00%	8.00%

		Annual Growth Rates Through 2000		
		Scenarios		Prenatal Care
		Baseline A	Baseline B	
Med. supplies cost growth		8.00%	8.00%	8.00%
Other supplies cost growth		8.00%	8.00%	8.00%
Other hospitals				
Drug cost growth		8.00%	8.00%	8.00%
Food cost growth		8.00%	8.00%	8.00%
Med. supplies cost growth		8.00%	8.00%	8.00%
Other supplies cost growth		8.00%	8.00%	8.00%
MOH hospitals				
OOP cost, total/OBD				
OOP cost, drugs/OBD				
MOHHU				
Efficiency	MD	0.00%	-1.39100%	-1.39100%
	Nurse	0.00%	-1.39100%	-1.39100%
	Other	0.00%	-1.39100%	-1.39100%
Salary growth	MD	8.00%	8.00%	8.00%
	Nurse	8.00%	8.00%	8.00%
	Other	8.00%	8.00%	8.00%
Drug cost growth		8.00%	8.00%	8.00%
Med. supplies cost growth		8.00%	8.00%	8.00%
Other supplies cost growth		8.00%	8.00%	8.00%
HIO clinics				
Efficiency	MD	0.00%	-3.38000%	-3.38000%
	Nurse	0.00%	-3.38000%	-3.38000%
	Other	0.00%	-3.38000%	-3.38000%
Salary growth	MD	8.00%	8.00%	8.00%
	Nurse	8.00%	8.00%	8.00%
	Other	8.00%	8.00%	8.00%
Drug cost growth		.	8.00%	8.00%
Med. supplies cost growth		10.00%	10.00%	10.00%
Other supplies cost growth		8.00%	8.00%	8.00%
Other govt., outpatient				
Efficiency	MD	0.00%	-0.51400%	-0.51400%
	Nurse	0.00%	-0.51400%	-0.51400%
	Other	0.00%	-0.51400%	-0.51400%
Salary growth	MD	8.00%	8.00%	8.00%
	Nurse	8.00%	8.00%	8.00%
	Other	8.00%	8.00%	8.00%

		Annual Growth Rates Through 2000		
		Scenarios		Prenatal Care
		Baseline A	Baseline B	
Private clinics				
Efficiency	MD	0.00%	-3.33600%	-3.33600%
	Nurse	0.00%	-3.33600%	-3.33600%
	Other	0.00%	-3.33600%	-3.33600%
Salary growth	MD	8.00%	8.00%	8.00%
	Nurse	8.00%	8.00%	8.00%
	Other	8.00%	8.00%	8.00%
Drug cost growth		12.00%	12.00%	12.00%
Med supplies cost growth		8.00%	8.00%	8.00%
Other supplies cost growth		8.00%	8.00%	8.00%
TH clinics				
Efficiency	MD	0.00%	-0.51400%	-0.51400%
	Nurse	0.00%	-0.51400%	-0.51400%
	Other	0.00%	-0.51400%	-0.51400%
Salary growth	MD	8.00%	8.00%	8.00%
	Nurse	8.00%	8.00%	8.00%
	Other	8.00%	8.00%	8.00%
Drug cost growth		8.00%	8.00%	8.00%
Med supplies cost growth		8.00%	8.00%	8.00%
Other supplies cost growth		8.00%	8.00%	8.00%
Other gov., outpatient				
Drug cost growth		8.00%	8.00%	8.00%
Med supplies cost growth		8.00%	8.00%	8.00%
Other supplies cost growth		8.00%	8.00%	8.00%
Untransferred funds, MOF/NIB				
CCO OOP expenditures per OBD		8.00%	8.00%	8.00%
HIO hospitals				
OOP cost, total/OBD		1.10%	1.10%	1.10%
OOP cost, drugs/OBD		10.00%	10.00%	10.00%
Private hospitals				
OOP cost, total/OBD		9.75%	9.75%	9.75%
OOP cost, drugs/OBD		12.00%	12.00%	12.00%
Donor funding to MOH		5.00%	5.00%	5.00%
MOH purchases of services from HIO		8.00%	8.00%	8.00%
MOH purchases of services from all other public providers		8.00%	8.00%	8.00%
MOH purchases of services from private hospitals		8.00%	8.00%	8.00%
MOH purchases of services from foreign providers		8.00%	8.00%	8.00%

	Annual Growth Rates Through 2000		
	Scenarios		Prenatal Care
	Baseline A	Baseline B	
MOH pharmacy payments	8.00%	8.00%	8.00%
Other hospitals			
OOP cost, total/OBD	8.00%	8.00%	8.00%
OOP cost, drugs/OBD	8.00%	8.00%	8.00%
MOH revenue from HIO	8.00%	8.00%	8.00%
Growth/decline in fertility rate			
Antenatal # of entitled contacts			2
Employment growth rate index	1.90%	1.90%	1.90%
Ratio of employees covered under Law 32			
Ratio of employees covered under Law 79			
Disposable income growth	8.00%	8.00%	8.00%
Law 32 employee contribution			
Law 32 employer contribution			
Law 79 employee contribution			
Law 79 employer contribution			
Law 32 compliance			
Law 79 compliance			
SHIP population rate-up factor			
School-aged children rate-up factor			
SHIP levy beneficiary contribution			
SHIP govt. contribution			
SHIP compliance households			
Labor accident premium contribution rate-HIO component			
Labor accident premium compliance rate			
Self-employed contribution			
Family business contribution			
Employee contribution from current waivers and nonenrolled companies			
Employer contribution from current waivers and nonenrolled companies			
Expected non-contribution compliance			
% of widows & pensioners among elderly			
Pensioners/widows contribution			
Pensioners/widows compliance			
HIO outpatient drug subsidy per contact	10.00%	10.00%	10.00%
Cigarette consumption health levy per pack			
HIO purchases from private hospitals	12.00%	12.00%	12.00%
Donor funding to HIO	5.00%	5.00%	5.00%

	Annual Growth Rates Through 2000		
	Scenarios		Prenatal Care
	Baseline A	Baseline B	
HIO purchases from other govt. providers	12.00%	12.00%	12.00%
HIO purchases from foreign, NGOs, and other	12.00%	12.00%	12.00%
SHIP compliance—govt. contribution			
HIO other operational revenue			
Firm purchases, other public hospitals	12.00%	12.00%	12.00%
Firm purchases, private hospitals	12.00%	12.00%	12.00%
Firm purchases, private clinics	12.00%	12.00%	12.00%
Firm purchases, pharmacies	12.00%	12.00%	12.00%
Private insurance/syndicate purchases, other public hospitals	12.00%	12.00%	12.00%
Private insurance/syndicate purchases, private hospitals	12.00%	12.00%	12.00%
Private insurance/syndicate purchases, private clinics	12.00%	12.00%	12.00%
Private insurance/syndicate purchases, pharmacies	12.00%	12.00%	12.00%
Private insurance/syndicate purchases, others	12.00%	12.00%	12.00%
Household purchases from NGOs & other providers	8.00%	8.00%	8.00%
Other ministry purchases from NGOs & foreign providers	8.00%	8.00%	8.00%
Donor funding ot other ministries	5.00%	5.00%	5.00%
Donor funding to NGOs	5.00%	5.00%	5.00%
Employer payments to syndicate schemes	12.00%	12.00%	12.00%
Employer payments to private insurers	12.00%	12.00%	12.00%
THIO, MOF, MOE, & MOSA purchases from other gov. providers	8.00%	8.00%	8.00%

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